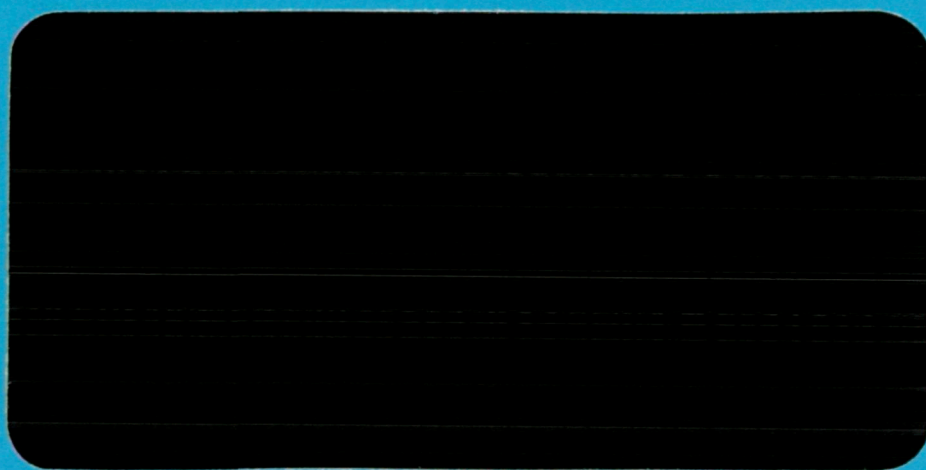


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# **GOODYEAR AEROSPACE CORPORATION**

AKRON, OHIO 44315

**FINAL REPORT  
SCALE DROGUE PARACHUTE MODEL  
CONTRACT NAS8-30848**

GER-16130

JULY 1974

**Prepared for  
George C Marshall Space Flight Center  
Huntsville, Alabama**

**Prepared by  
Goodyear Aerospace Corporation  
Akron, Ohio**



FOREWORD

This report has been prepared by Goodyear Aerospace Corporation (GAC) under Contract NAS-8-30848 entitled, "Scale Drogue Parachute Models," for the George C Marshall Space Flight Center of the National Aeronautics and Space Administration. The work of this contract was performed from April 30, 1974 through June 28, 1974.

The primary contributing personnel at Goodyear Aerospace was Mr. Daniel Henke project engineer.

The MSFC project engineer was Mr. David Baachus, S&E - AERO - AAV.

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1. Summary

Under Contract NAS8-30848, Goodyear Aerospace Corporation provided to George C Marshall Space Flight Center the following.

- a. Three 12.5% scale drogue parachute models as described in NASA supplied drawing 86375 which has a porosity of 16% and three 12.5% scale drogue parachute models as described in NASA supplied drawing 86376 which has a porosity of 24%.

Deployment bags were furnished for each of the six drogue parachute models in accordance with NASA supplied drawing 86377.

- b. Two 12.5% scale pilot parachute models as outlined in the NASA supplied drawing 86378. Deployment bags were furnished for each of the two pilot parachute models in accordance with GAC drawing 74QS892.

- c. This final report.

In supplying the above hardware, GAC also.

- a. Reviewed each of the drawings. Recommendations were made and incorporated into the fabrication of the parachutes and deployment bags.
- b. Fabricated tooling aids for the 86375-1, 86376-1, and the 86378-1 parachutes to insure accurate placement of the horizontal ribbons and radial tapes during fabrication of the gores.
- c. Obtained dimensional measurements and overall porosity measurements on each of the parachutes fabricated to insure a data base for interpretation of the wind tunnel test data.

## 2. Drawing Review

The drogue parachute models, pilot parachute models and their deployment bags were fabricated according to the following drawing.

drogue parachute model	Dwg. No. 86375 and Dwg. No. 86376
deployment bag	Dwg. No. 86377
pilot parachute	Dwg. No. 86378

A copy of each is contained in Appendix A.

In addition, GAC fabricated two pilot deployment bags according to GAC drawing 74QS892. A copy of this drawing is also contained in Appendix A.

Each of the drawings were reviewed for consistency of design in light of their intended use with the result that the changes listed in Tables I through V, were recommended and incorporated into the design of the parachute.

The major difference between the original drawing and that recommended by GAC was the number of horizontal ribbons in each parachute to maintain the desired geometric porosity.

Examination of the MIL-T-5608 Class A, Type I, 1/4 inch wide material received for use as horizontal ribbons in the parachute showed that the material was generally less than the nominal 0.25 inches width as defined in the specification. Ten rolls of the 41 received were measured using a 1/100 inch scale steel rule under 2X magnification. The average width of the ten rolls was 0.234 inches. The specification defines the width tolerance as  $\pm 0.0156$  inches. For the low tolerance the allowable width is 0.2344 inches.



Table I - Changes to Drawing 86375 for S/N 001 and S/N 002

Zone	Item	Was	Is Now	Reason
11-H	-15 vent band	MIL-T-5608, Type I, CL.A. 13 lb. (2 ply)	MIL-T-5608, Type I, CL.C. 39 lb. (1 ply)	Better mass simulation
20-G	Connector link	101735 Link Capewell Mfg. Co.	MS 22021-1 Connector link	Wrong size item called out
7-H	General Note #1	Size E nylon thread	Size B nylon thread (unless otherwise specified)	Better mass simulation
2-D	Parts list	-	Size B nylon thread	Additional material
11-A	Gore dimension	37.45	37.38	To maintain porosity with present material (material width equal to spec minimum)
10-B	Horizontal ribbon	125 Req'd	133 Req'd	" " "
9-B	Gap dimension	124 equal spaces at 0.05	132 equal spaces at 0.047	" " "
5-D	-19 Keeper	MIL-T-2283 1 1/2", 90#	MIL-T-5608 Type III Class C 5/8", 90#	Better mass simulation

Table II - Changes to Drawing 86375 for S/N 003

Zone	Item	Was	Is Now	Reason
10-B	-7 Horizontal Ribbon	MIL-T-5038 Type I Class A	MIL-T-5038 Type I Class C	Availability of Material
12-C	-9 Radial Tape	MIL-T-5038 Type I Class A	MIL-T-5038 Type I Class C	Availability of Material
16-G	-21 Pocket Band	MIL-T-5038 Type I Class A	MIL-T-5038 Type I Class C	Availability of Material

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Table III - Changes to Drawing 86376

Zone	Item	Was	Is Now	Reason
11-H	-15 Vent band	MIL-T-5608, Type I, CL.A. 13 lb. (2 ply)	MIL-T-5608, Type I, CL.C 39 lb. (1 ply)	Better mass simulation
20-G	Connector link	101735 Link Capewell Mfg Co.	MS 22021-1 Connector link	Wrong size item called out
7-H	General Note #1	Size E nylon thread	Size B nylon thread (unless otherwise specified)	Better mass simulation
2-D	Parts List	-	Size B nylon thread	Additional material
11-A	Gore dimension	37.37	37.25	To maintain porosity with present material (material width equal to spec minimum)
10-B	Horizontal ribbon	111 req'd	118 req'd	" " "
9-B	Gap dimension	110 equal spaces at 0.0875	117 equal spaces at 0.082	" " "
6-D	-19 Keeper	MIL-T-2283 1/2", 90#	MIL-T-5608 Type III Class C 5/8", 90#	Better mass simulation

Table IV - Changes to Drawing 86377

Zone	Item	Was	Is Now	Reason
8-B	-7 Band	MIL-T-5038	MIL-T-5038	Better mass simulation
7-C	-9 Strap	Type III 3/8"	Type III 1/2"	
7-D	-11 Strap			
22-D	-27 Strap			
22-C	-29 Strap			
7-E	-31 Loop			
6-D	-33 Keeper			
8-E	-35 Loop			
22-C	-25 Loop	MIL-T-5661 Type I 3/8", 120#	MIL-T-5661 Type III 3/4", 75# 2 ply, folded	Better mass simulation
12-B	-37 Loop	MIL-T-5661 Type I 3/8", 120#	MIL-T-5661 Type III 3/4", 75# 2 ply, folded	Better mass simulation

Table V - Changes to Drawing 86378

Zone	Item	Was	Is Now	Reason
7-H	General Note #1	Size E nylon thread	Size B thread unless otherwise specified	Better mass simulation
2-O	Parts List	-	Size B nylon thread	Additional Material
8-B	Horizontal ribbon	16 req'd	17 req'd	Maintain porosity with present material (material width equal to spec minimum)
8-B	Gap dimension	.10 slot type	.095 slot type	" " "

Considering the measurement method utilized, the average width was equal to the minimum specification value.

Discussions with MSFC established that the established geometric porosity of 16% and 24% for the drogue models and 24% for the pilot model should be maintained. Therefore the recommended action was to increase the number of horizontal ribbons.

Table VI lists the number of ribbons used, the gap width and length of gore used to obtain the correct geometric porosity for each of the parachutes. As can be seen from the table, all of the units changed except 86375-1 S/N 003, which, when additional material was ordered to fabricate this unit, the horizontal ribbon material measured the nominal 0.25 inches. Therefore no change was required and this unit remained a 125 ribbon parachute.

### 3. Manufacture of the Parachute

The manufacturing of the parachutes and deployment bags took place in Goodyear Aerospace Corporation's fabric development area.

Four tooling aids were fabricated to aid in the construction of the gores for the various parachutes. One tooling aid was fabricated for each of the 86376-1 and 86378-1 parachutes. Two tooling aids were fabricated for the 86375-1 parachute, the first containing 133 horizontal ribbons for S/N 001 and S/N 002 and the second with 125 ribbons for S/N 003.

Using the tooling aids allowed for uniform, quick and accurate fabrication of the parachute gores with a minimum of handling small lengths of ribbon.

Figures 1, 2 and 3 show a typical completed canopy.

Table VI - Number of Horizontal Ribbons Increased to  
Maintain the Correct Geometric Porosity

Dwg. No.	Serial No.	Was				Revised <sup>①</sup>			
		No. of Ribbons	Ribbon Width (Inches)	Gap Width (Inches)	Gore <sup>②</sup> Length (Inches)	No. of Ribbons	Ribbon Width (Inches)	Gap Width (Inches)	Gore <sup>②</sup> Length (Inches)
86375	001,002 <sup>③</sup>	125	0.25	0.050	37.45	133	0.2344	0.047	37.38
86376	001,002,003	111	0.25	0.0875	37.37	118	0.2344	0.082	37.25
86378		16	0.25	0.100	5.50	17	0.2344	0.095	5.50

- Notes: ① Changes were defined by maintaining a constant ratio of gap width/ribbon width
- ② Measured from vent band to skirt band, total length for gore layout remains 41.75 per drawing 68375 and 68376
- ③ S/N 003 remained at the 125 ribbon, 0.25 ribbon width, 0.050 gap width and 37.45 gore length



Figure 1 - Photograph of one of the Manufactured Canopies





Figure 2 - Photograph of the Drag Producing Surface on One  
Of the Manufactured Canopies



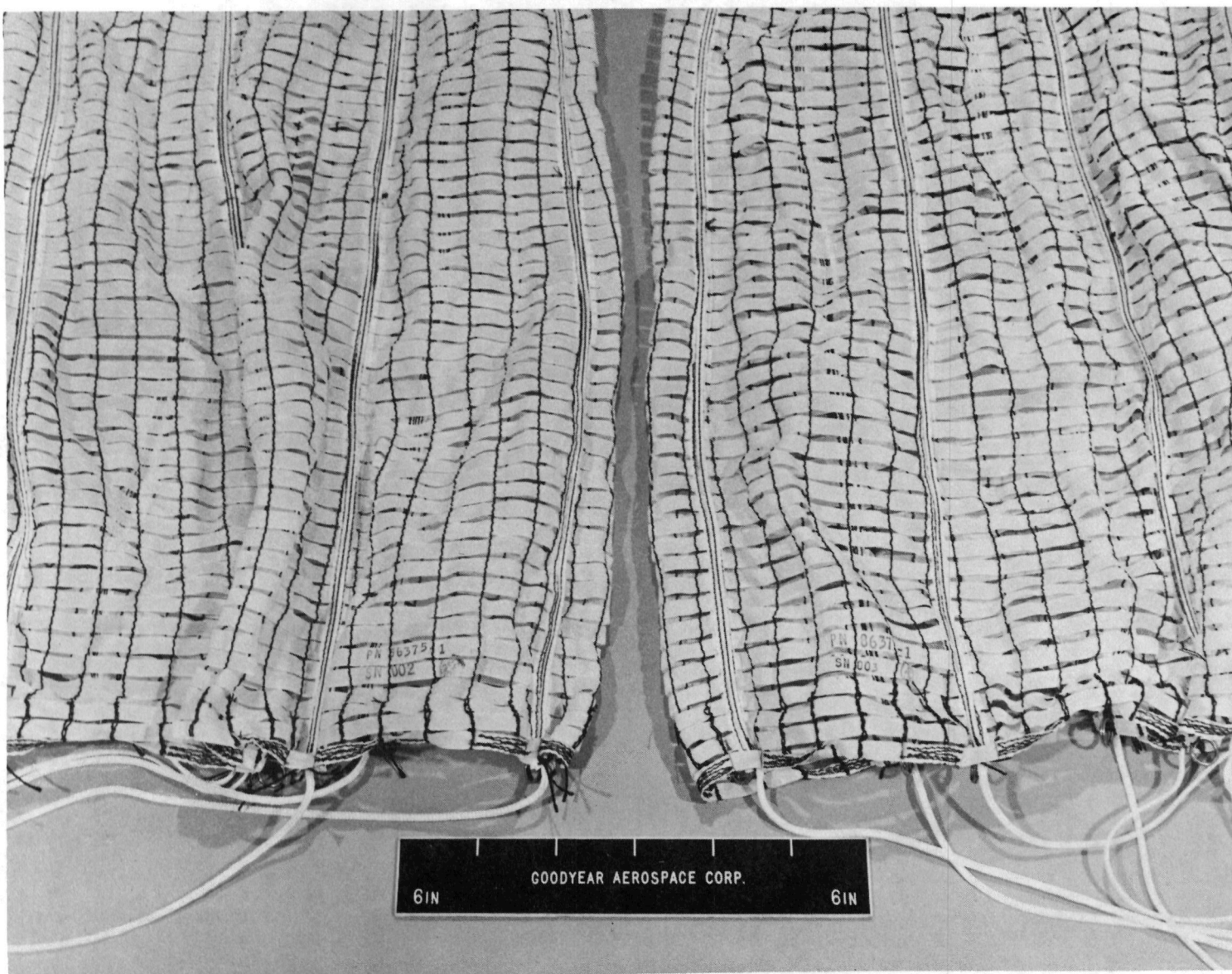


Figure 3 - Detail View of Parachute 36375-1 S/N 002 and 36376-1 S/N 003

The riser and deployment bags did not require any special tools and were fabricated by conventional methods. See figure 4.

Fabrication was handled by fabric development personnel who are qualified as parachute material cutters, sewing machine operators, parachute fabricators and parachute riggers.

Fabrication was handled in a step-by-step manner by the use of process cards.

No fabrication problems were encountered during construction of any of the canopies, risers, or deployment bags.

4. Measurements

After fabrication, the following measurements were recorded for each parachute.

a. Linear dimensions as shown in figure 5.

These dimensions are contained in Tables VII through XII. The tension on each member at the time of measurements and the accuracy of each measurement is also shown in the table. Dimensions were taken with a scale whose divisions were marked in 1/16 of an inch.

b. Overall Porosity

To establish the overall porosity of each parachute (material porosity and the geometric porosity) a Frazier Diffusion test was conducted at eight locations for the 86375-1 and 86376-1 parachutes and at four locations for the 86378-1 parachutes.

For the 86375-1 and 86376-1 parachutes the measurements were taken at the skirt and at mid gore on gores #1, 14, 27 and 40.



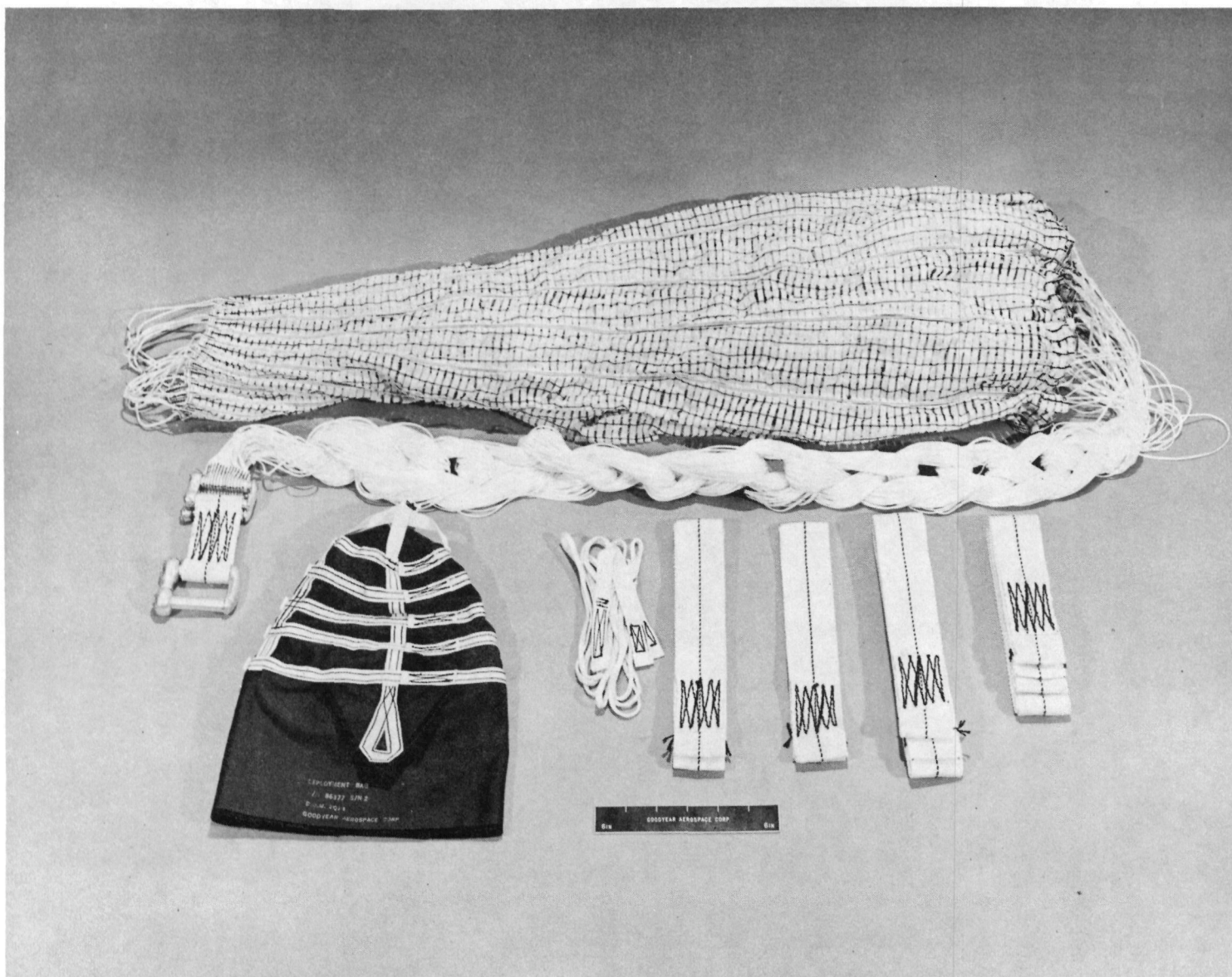


Figure 4 - Photograph of a Manufactured Pilot Deployment Bag,  
Various Length Risers and Canopy

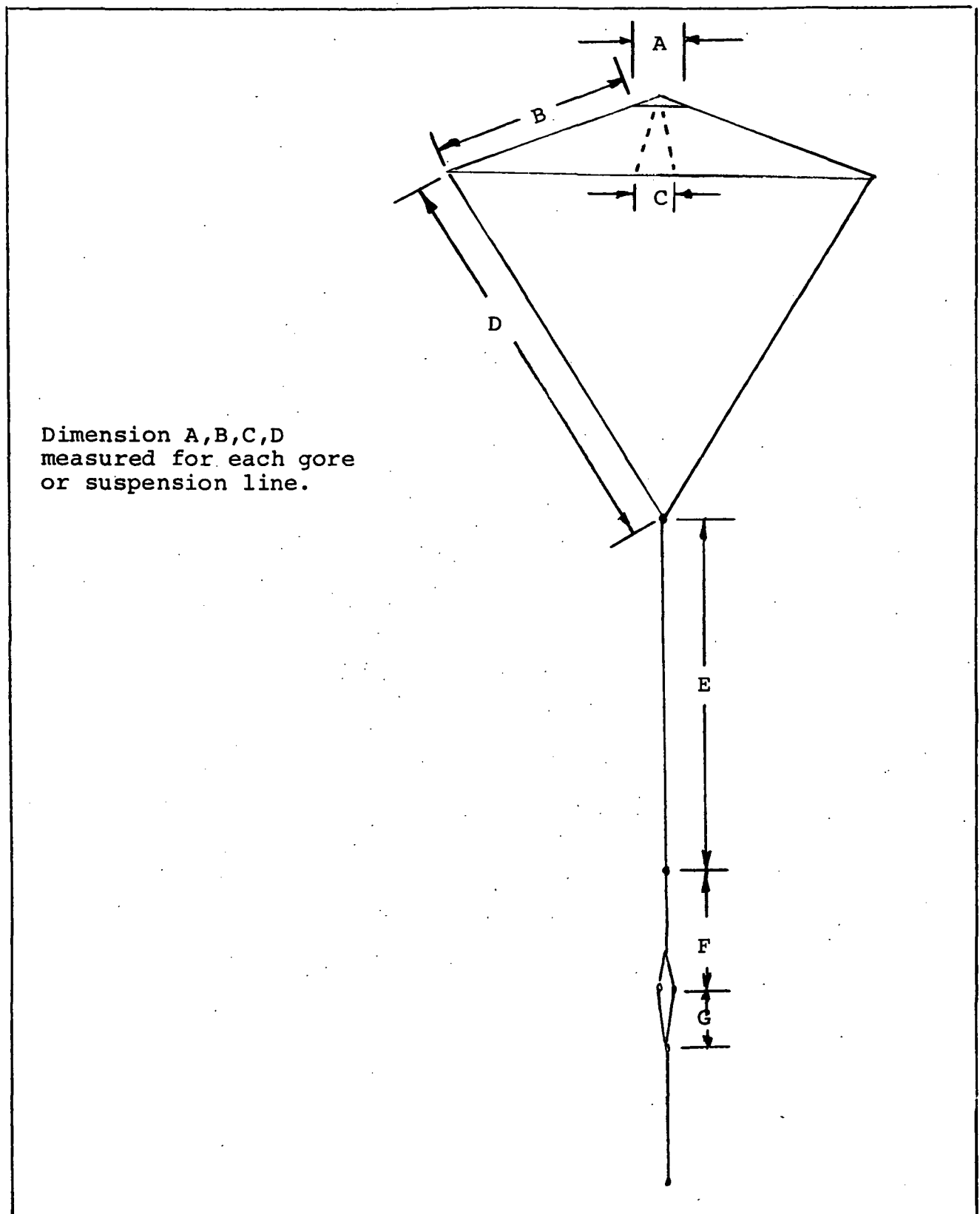


Figure 5 - Dimensions Recorded on Each Parachute to Establish Symmetry

Table VII - Linear Dimensions for Parachute P/N 86375-1 S/N 001

GORE	A		B		C		D	
	CM	INCHES	CM	INCHES	CM	INCHES	CM	INCHES
1	19.4	7-5/8	92.7	36-1/2	11.1	4-3/8	206.4	81-1/4
2			92.1	36-1/4	11.3	4-7/16	206.4	81-1/4
3	19.7	7-3/4	92.7	36-1/2	11.4	4-1/2	206.4	81-1/4
4	19.7	7-3/4	91.4	36	11.3	4-7/16		
5			92.1	36-1/4	11.3	4-7/16		
6	19.7	7-3/4	92.7	36-1/2	11.1	4-3/8	Not	Not
7			92.7	36-1/2	11.1	4-3/8	Tacked	Tacked
8	19.7	7-3/4	92.1	36-1/4	11.1	4-3/8		
9			92.1	36-1/4	11.1	4-3/8		
10	19.7	7-3/4	92.1	36-1/4	11.3	4-7/16		
11			92.1	36-1/4	11.1	4-3/8		
12	19.7	7-3/4	92.1	36-1/4	11.3	4-7/16		
13			92.7	36-1/2	11.3	4-7/16	207.0	81-1/2
14	19.7	7-3/4	92.1	36-1/4	11.1	4-3/8	205.7	81
15			92.1	36-1/4	11.4	4-1/2	205.7	81
16	19.7	7-3/4	92.1	36-1/4	11.3	4-7/16		
17			91.4	36	11.3	4-7/16		
18	19.7	7-3/4	92.1	36-1/4	11.3	4-7/16		
19			92.1	36-1/4	11.3	4-7/16	Not	Not
20	19.4	7-5/8	92.1	36-1/4	11.1	4-3/8	Tacked	Tacked
21			92.1	36-1/4	11.3	4-7/16		
22	19.7	7-3/4	92.1	36-1/4	11.1	4-3/8		
23			92.1	36-1/4	11.3	4-7/16		
24	19.7	7-3/4	91.4	36	11.1	4-3/8		
25			92.1	36-1/4	11.4	4-1/2		
26	19.7	7-3/4	92.7	36-1/2	11.4	4-1/2		
27			92.7	36-1/2	11.4	4-1/2		
28			92.1	36-1/4	11.3	4-7/16	205.7	81
29			92.7	36-1/2	11.1	4-3/8	205.7	81
30			92.7	36-1/2	11.4	4-1/2	205.7	81
31			92.7	36-1/2	11.3	4-7/16		
32			92.1	36-1/4	11.3	4-7/16		
33			92.1	36-1/4	11.1	4-3/8		
34			92.1	36-1/4	11.4	4-1/2		
35			92.7	36-1/2	11.3	4-7/16	Not	Not
36			92.7	36-1/2	11.4	4-1/2	Tacked	Tacked
37			92.7	36-1/2	11.4	4-1/2		
38			92.7	36-1/2	11.1	4-3/8		
39			92.7	36-1/2	11.3	4-7/16		
40			92.1	36-1/4	11.3	4-7/16	205.7	81
41			92.7	36-1/2	11.3	4-7/16	206.4	81-1/4
42			92.7	36-1/2	11.3	4-7/16	206.4	81-1/4
43			92.7	36-1/2	11.1	4-3/8		
44			92.1	36-1/4	11.3	4-7/16		
45			92.1	36-1/4	11.3	4-7/16	Not	Not
46			92.1	36-1/4	11.3	4-7/16	Tacked	Tacked
47			92.7	36-1/2	11.1	4-3/8		
48			92.7	36-1/2	11.1	4-3/8		
49			91.4	36	11.3	4-7/16		
50			92.1	36-1/4	11.1	4-3/8		
51			92.1	36-1/4	11.1	4-3/8		
52			92.1	36-1/4	11.3	4-7/16		
53			92.1	36-1/4	11.1	4-3/8		
54			92.7	36-1/2	11.3	4-7/16		
TENSION	NO SLACK		5 LBS.		1 LB.		5 LBS.	

F = 26.0 cm (10-1/4 in)  
E+F = 227 cm (88-3/4 in)  
G = 8.4 cm (3-1/2 in)

## ACCURACY

B, D, E+F, F measured closest .6 cm (1/4 in)  
A, G measured closest .3 cm (1/8 in)  
C measured closest .16 cm (1/16 in)



Table VIII - Linear Dimensions for Parachute P/N 86375-1 S/N 002

GORE	A		B		C		D	
	CM	INCHES	CM	INCHES	CM	INCHES	CM	INCHES
1	19.7	7-3/4	92.1	36-1/4	11.4	4-1/2	205.7	81
2			92.7	36-1/2	11.4	4-1/2	206.4	81-1/4
3	19.2	7-1/2	92.7	36-1/2	11.1	4-3/8	205.7	81
4	19.7	7-3/4	92.7	36-1/2	11.3	4-7/16	↑	↑
5			92.1	36-1/4	11.3	4-7/16		
6	20.2	7-7/8	92.1	36-1/4	11.3	4-7/16		
7			92.1	36-1/4	11.1	4-3/8	Not	Not
8	19.7	7-3/4	92.7	36-1/2	11.4	4-1/2	Tacked	Tacked
9			92.7	36-1/2	11.3	4-7/16	↓	↓
10	19.4	7-5/8	92.7	36-1/2	11.4	4-1/2		
11			92.7	36-1/2	11.4	4-1/2		
12	19.4	7-5/8	92.7	36-1/2	11.4	4-1/2		
13			92.1	36-1/4	11.1	4-3/8	206.4	81-1/4
14	19.7	7-3/4	92.1	36-1/4	11.3	4-7/16	206.4	81-1/4
15			92.7	36-1/2	11.3	4-7/16	205.7	81
16	19.4	7-5/8	92.7	36-1/2	11.3	4-7/16	↑	↑
17			92.1	36-1/4	11.1	4-3/8		
18	19.4	7-5/8	92.7	36-1/2	11.3	4-7/16		
19			92.1	36-1/4	11.3	4-7/16		
20	19.4	7-5/8	92.1	36-1/4	11.3	4-7/16	Not	Not
21			92.1	36-1/4	11.3	4-7/16	Tacked	Tacked
22	19.7	7-3/4	92.1	36-1/4	11.4	4-1/2	↓	↓
23			92.1	36-1/4	11.1	4-3/8		
24	19.7	7-3/4	92.1	36-1/4	11.1	4-3/8		
25			92.1	36-1/4	11.3	4-7/16		
26	19.4	7-5/8	92.1	36-1/4	11.3	4-7/16		
27			92.1	36-1/4	11.1	4-3/8	↓	↓
28			92.1	36-1/4	11.4	4-1/2	206.4	81-1/4
29			92.1	36-1/4	11.3	4-7/16	206.4	81-1/4
30			92.7	36-1/2	11.3	4-7/16	205.7	81
31			92.1	36-1/4	11.4	4-1/2	↑	↑
32			92.1	36-1/4	11.4	4-1/2		
33			92.1	36-1/4	11.4	4-1/2		
34			92.1	36-1/4	11.4	4-1/2	Not	Not
35			92.7	36-1/2	11.3	4-7/16	Tacked	Tacked
36			92.1	36-1/4	11.3	4-7/16	↓	↓
37			92.7	36-1/2	11.1	4-3/8		
38			92.7	36-1/2	11.1	4-3/8		
39			92.7	36-1/2	11.1	4-3/8		
40			92.7	36-1/2	11.1	4-3/8	206.4	81-1/4
41			92.7	36-1/2	11.3	4-7/16	205.7	81
42			92.7	36-1/2	11.4	4-1/2	206.4	81-1/4
43			92.1	36-1/4	11.1	4-3/8	↑	↑
44			92.1	36-1/4	11.1	4-3/8		
45			92.7	36-1/2	11.1	4-3/8		
46			92.7	36-1/2	11.1	4-3/8	Not	Not
47			92.7	36-1/2	11.4	4-1/2	Tacked	Tacked
48			92.7	36-1/2	11.1	4-3/8	↓	↓
49			92.1	36-1/4	11.3	4-7/16		
50			92.1	36-1/4	11.3	4-7/16		
51			92.1	36-1/4	11.1	4-3/8		
52			92.1	36-1/4	11.1	4-3/8		
53			92.1	36-1/4	11.3	4-7/16	↓	↓
54			92.3	36-1/2	11.4	4-1/2		
TENSION	NO SLACK		5 LBS.		1 LB.		5 LBS	

F = 26.0 cm (10-1/4 in)  
 E+F = 227 cm (88-3/4 in)  
 G = 8.6 cm (3-3/8 in)

## ACCURACY

B, D, E+F, F measured closest .6 cm (1/4 inch)  
 A, G measured closest .3 cm (1/8 inch)  
 C measured closest .16 cm (1/16 inch)

Table IX - Linear Dimensions for Parachute P/N 86375-1 S/N 003

GORE	A		B		C		D	
	CM	INCHES	CM	INCHES	CM	INCHES	CM	INCHES
1	19.2	7-1/2	92.4	36-3/8	11.1	4-3/8	205.7	81.0
2			92.4	36-3/8	11.3	4-7/16	205.7	81.0
3	19.2	7-1/2	92.4	36-3/8	11.3	4-7/16	206.4	81-1/4
4	19.2	7-1/2	92.7	36-1/2	11.1	4-3/8	↑	↑
5			92.4	36-3/8	11.3	4-7/16	↑	↑
6	19.2	7-1/2	92.4	36-3/8	11.1	4-3/8	Not	Not
7			92.4	36-3/8	11.3	4-7/16	Tacked	Tacked
8	18.7	7-3/8	92.1	36-1/4	11.3	4-7/16	↓	↓
9			92.4	36-3/8	11.1	4-3/8	↓	↓
10	19.4	7-5/8	92.7	36-1/2	11.3	4-7/16	↓	↓
11			92.7	36-1/2	11.3	4-7/16	↓	↓
12	19.2	7-1/2	92.7	36-1/2	11.3	4-7/16	↓	↓
13			92.7	36-1/2	11.3	4-7/16	206.0	81-1/8
14	19.4	7-5/8	92.7	36-1/2	11.4	4-1/2	205.7	81.0
15			92.4	36-3/8	11.3	4-7/16	205.7	81.0
16	19.2	7-1/2	92.4	36-3/8	11.1	4-3/8	↑	↑
17			92.4	36-3/8	11.4	4-1/2	↑	↑
18	19.2	7-1/2	92.1	36-1/4	11.3	4-7/16	Not	Not
19			92.1	36-1/4	11.1	4-3/8	Tacked	Tacked
20	18.4	7-1/4	92.1	36-1/4	11.4	4-1/2	↓	↓
21			92.4	36-3/8	11.4	4-1/2	↓	↓
22	18.7	7-3/8	92.7	36-1/2	11.4	4-1/2	↓	↓
23			92.4	36-3/8	11.3	4-7/16	↓	↓
24	19.2	7-1/2	92.4	36-3/8	11.3	4-7/16	↓	↓
25			92.4	36-3/8	11.3	4-7/16	↓	↓
26	19.4	7-5/8	92.7	36-1/2	11.3	4-7/16	↓	↓
27			92.7	36-1/2	11.4	4-1/2	↓	↓
28			92.4	36-3/8	11.3	4-7/16	205.7	81.0
29			92.4	36-3/8	11.3	4-7/16	205.7	81.0
30			92.4	36-3/8	11.3	4-7/16	205.7	81.0
31			92.7	36-1/2	11.3	4-7/16	↑	↑
32			92.4	36-3/8	11.3	4-7/16	↑	↑
33			92.7	36-1/2	11.1	4-3/8	Not	Not
34			92.7	36-1/2	11.3	4-7/16	Tacked	Tacked
35			92.7	36-1/2	11.4	4-1/2	↓	↓
36			92.7	36-1/2	11.3	4-7/16	↓	↓
37			92.7	36-1/2	11.3	4-7/16	↓	↓
38			92.7	36-1/2	11.1	4-3/8	↓	↓
39			92.7	36-1/2	11.3	4-7/16	↓	↓
40			92.7	36-1/2	11.3	4-7/16	206.0	81-1/8
41			92.7	36-1/2	11.4	4-1/2	205.7	81.0
42			92.7	36-1/2	11.4	4-1/2	205.7	81.0
43			92.7	36-1/2	11.4	4-1/2	↑	↑
44			92.7	36-1/2	11.3	4-7/16	↑	↑
45			93.1	36-5/8	11.3	4-7/16	Not	Not
46			92.7	36-1/2	11.4	4-1/2	Tacked	Tacked
47			92.7	36-1/2	11.3	4-7/16	↓	↓
48			92.7	36-1/2	11.3	4-7/16	↓	↓
49			93.1	36-5/8	11.4	4-1/2	↓	↓
50			92.7	36-1/2	11.4	4-1/2	↓	↓
51			92.4	36-3/8	11.3	4-7/16	↓	↓
52			92.4	36-3/8	11.3	4-7/16	↓	↓
53			92.4	36-3/8	11.3	4-7/16	↓	↓
54			92.4	36-3/8	11.3	4-7/16	↓	↓
TENSION	NO SLACK		5 LBS.		1 LB.		5 LBS.	

P = 26.0 cm (10-1/4 in)

E+F = 227 cm (88-3/4 in)

G = 8.4 cm (3-1/2 in)

## ACCURACY

E+F, P measured closest .6 cm (1/4 inch)

A, B, D, G measured closest .3 cm (1/8 inch)

C measured closest .16 cm (1/16 inch)

Table X - Linear Dimensions for Parachute 86376-1 S/N 001

GORE	A		B		C		D	
	CM	INCHES	CM	INCHES	CM	INCHES	CM	INCHES
1	21.0	8-1/4	91.4	36		4-1/4	205.7	81
2			90.8	35-3/4	11.1	4-3/8	205.1	80-3/4
3	20.3	8	90.8	35-3/4	11.4	4-1/2	205.7	81
4	20.3	8	91.4	36	11.4	4-1/2		
5			90.8	35-3/4	11.1	4-3/8		
6	19.7	7-3/4	91.4	36	11.1	4-3/8	Not	Not
7			90.8	35-3/4	10.8	4-1/4	Tacked	Tacked
8	19.7	7-3/4	90.8	35-3/4	11.4	4-1/2		
9			90.8	35-3/4	11.1	4-3/8		
10	19.7	7-3/4	90.8	35-3/4	11.1	4-3/8		
11			90.8	35-3/4	11.4	4-1/2		
12	19.4	7-5/8	90.8	35-3/4	11.4	4-1/2		
13			90.8	35-3/4	11.1	4-3/8	206.4	81-1/4
14	20.0	7-7/8	90.8	35-3/4	11.4	4-1/2	205.7	81
15			90.8	35-3/4	11.1	4-3/8	205.7	81
16	19.7	7-3/4	90.8	35-3/4	11.1	4-3/8		
17			90.8	35-3/4	11.1	4-3/8		
18	20.3	8	90.8	35-3/4	11.1	4-3/8	Not	Not
19			90.8	35-3/4	11.1	4-3/8	Tacked	Tacked
20	18.4	7-1/4	90.8	35-3/4	11.1	4-3/8		
21			90.8	35-3/4	11.1	4-3/8		
22	20.0	7-7/8	90.8	35-3/4	11.1	4-3/8		
23			90.2	35-1/2	11.4	4-1/2		
24	19.1	7-1/2	90.8	35-3/4	11.1	4-3/8		
25			91.4	36	11.1	4-3/8		
26	20.0	7-7/8	90.8	35-3/4	11.1	4-3/8		
27			90.2	35-1/2	11.1	4-3/8		
28			91.4	36	10.8	4-1/4	205.7	81
29			90.8	35-3/4		4-1/4	205.7	81
30			90.8	35-3/4	11.4	4-1/2	205.7	81
31			90.8	35-3/4	11.1	4-3/8		
32			90.8	35-3/4	11.1	4-3/8		
33			90.8	35-3/4	11.1	4-3/8	Not	Not
34			90.8	35-3/4	10.8	4-1/4	Tacked	Tacked
35			91.4	36	10.8	4-1/4		
36			90.8	35-3/4	11.1	4-3/8		
37			92.1	36-1/4	10.8	4-1/4		
38			90.8	35-3/4	10.8	4-1/4		
39			90.2	35-1/2	11.1	4-3/8		
40			90.2	35-1/2	10.8	4-1/4	205.7	81
41			90.8	35-3/4	11.1	4-3/8	205.7	81
42			90.2	35-1/2	11.1	4-3/8	205.7	81
43			90.8	35-3/4	11.1	4-3/8		
44			91.4	36	11.1	4-3/8		
45			91.4	36	11.4	4-1/2	Not	Not
46			91.4	36	11.1	4-3/8	Tacked	Tacked
47			90.8	35-3/4	11.1	4-3/8		
48			90.8	35-3/4	11.1	4-3/8		
49			91.4	36	11.1	4-3/8		
50			90.8	35-3/4	11.1	4-3/8		
51			90.8	35-3/4	11.1	4-3/8		
52			90.8	35-3/4	11.4	4-1/2		
53			90.8	35-3/4	11.4	4-1/2		
54			91.4	36	11.4	4-1/2		
TENSION	NO SLACK		5 LBS.		1 LB.		5 LBS.	

F = 26.7 cm (10-1/2 In)  
 E+F = 229.2 (90-1/4 In) (No Slack)  
 G + 8.6 cm (3-3/8 In)

## ACCURACY

B, D, E+F, F measured closest .6 cm (1/4 inch)  
 A, G measured closest .3 cm (1/8 inch)  
 C measured closest .16 (1/16 inch)

Table XI - Linear Dimensions for Parachute P/N 86376-1 S/N 002

GORE	A		B		C		D	
	CM	INCHES	CM	INCHES	CM	INCHES	CM	INCHES
1	20.3	8	90.8	35-3/4	11.1	4-3/8	206.4	81-1/4
2			91.4	36	11.1	4-3/8	205.7	81
3	20.2	7-7/8	91.4	36	11.3	4-7/16	205.7	81
4	20.2	7-7/8	91.4	36	10.8	4-1/4		
5			91.4	36	11.1	4-3/8		
6	20.6	8-1/8	91.4	36	11.1	4-3/8	Not	Not
7			92.1	36-1/4	11.1	4-3/8	Tacked	Tacked
8	20.3	8	91.4	36	11.1	4-3/8		
9			92.1	36-1/4	11.4	4-1/2		
10	20.6	8-1/8	92.1	36-1/4	11.1	4-3/8		
11			91.4	36	10.9	4-5/16		
12	20.6	8-1/8	91.4	36	11.1	4-3/8		
13			91.4	36	11.1	4-3/8	205.7	81
14	20.6	8-1/8	91.4	36	11.1	4-3/8	205.7	81
15			91.4	36	11.1	4-3/8	205.7	81
16	20.3	8	92.1	36-1/4	11.1	4-3/8		
17			91.4	36	11.1	4-3/8		
18	20.3	8	92.1	36-1/4	11.1	4-3/8	Not	Not
19			91.4	36	11.1	4-3/8	Tacked	Tacked
20	20.2	7-7/8	91.4	36	11.1	4-3/8		
21			91.4	36	11.3	4-7/16		
22	20.3	8	91.4	36	10.9	4-5/16		
23			90.8	35-3/4	11.3	4-7/16		
24	20.2	7-7/8	91.4	36	11.1	4-3/8		
25			91.4	36	11.1	4-3/8		
26	20.2	7-7/8	91.4	36	11.3	4-7/16		
27			91.4	36	11.1	4-3/8		
28			90.8	35-3/4	11.3	4-7/16	205.7	81
29			91.4	36	11.1	4-3/8	205.7	81
30			91.4	36	11.3	4-7/16	205.7	81
31			91.4	36	11.4	4-1/2		
32			90.8	35-3/4	11.3	4-7/16		
33			90.8	35-3/4	11.3	4-7/16	Not	Not
34			90.8	35-3/4	11.4	4-1/2	Tacked	Tacked
35			90.8	35-3/4	11.4	4-1/2		
36			90.8	35-3/4	11.1	4-3/8		
37			91.4	36	11.4	4-1/2		
38			91.4	36	11.4	4-1/2		
39			91.4	36	11.3	4-7/16		
40			91.4	36	11.4	4-1/2	205.7	81
41			91.4	36	11.4	4-1/2	206.4	81-1/4
42			91.4	36	11.3	4-7/16	205.7	81
43			91.4	36	11.4	4-1/2		
44			90.8	35-3/4	11.4	4-1/2		
45			91.4	36	11.1	4-3/8	Not	Not
46			91.4	36	10.9	4-5/16	Tacked	Tacked
47			91.4	36	10.9	4-5/16		
48			90.8	35-3/4	11.1	4-3/8		
49			91.4	36	11.1	4-3/8		
50			91.4	36	11.1	4-3/8		
51			91.4	36	11.1	4-3/8		
52			90.8	35-3/4	11.1	4-3/8		
53			91.4	36	11.3	4-7/16		
54			90.8	35-3/4	11.4	4-1/2		
TENSION	NO SLACK		5 LBS.		1 LB.		5 LBS.	

F = 26.0 cm (10-1/4 in)  
 E+F = 225.0 cm (88-5/8 in)  
 G = 8.6 cm (3-3/8 in)

## ACCURACY:

B, D, F measured closest .6 cm (1/4 inch)  
 A, E+F measured closest .3 cm (1/8 inch)  
 C, G measured closest .16 cm (1/16 inch)

Table XII - Linear Dimensions for Parachute P/N 86376-1 S/N 003

GORE	A		B		C		D	
	CM	INCHES	CM	INCHES	CM	INCHES	CM	INCHES
1	20.2	7-7/8	91.4	36	11.1	4-3/8	205.0	80-3/4
2			91.4	36	11.1	4-3/8	205.7	81
3	20.2	7-7/8	91.4	36	11.1	4-3/8	205.7	81
4	20.2	7-7/8	92.1	36-1/4	11.3	4-7/16		
5			91.4	36	11.4	4-1/2		
6	20.2	7-7/8	91.4	36	11.3	4-7/16	Not	Not
7			90.8	35-3/4	11.1	4-3/8	Tacked	Tacked
8	20.3	8	90.8	35-3/4	11.3	4-7/16		
9			91.4	36	11.3	4-7/16		
10	20.2	7-7/8	92.1	36-1/4	11.1	4-3/8		
11			91.4	36	11.3	4-7/16		
12	20.2	7-7/8	91.4	36	11.1	4-3/8		
13			91.4	36	11.1	4-3/8	205.7	81
14	20.2	7-7/8	91.4	36	11.4	4-1/2	205.4	81-1/4
15			90.8	35-3/4	11.1	4-3/8	205.7	81
16	20.3	8	91.4	36	11.1	4-3/8		
17			90.8	35-3/4	11.1	4-3/8		
18	20.2	7-7/8	90.8	35-3/4	11.3	4-7/16	Not	Not
19			90.8	35-3/4	11.1	4-3/8	Tacked	Tacked
20	20.3	8	90.8	35-3/4	11.3	4-7/16		
21			91.4	36	11.1	4-3/8		
22	20.2	7-7/8	90.8	35-3/4	11.1	4-3/8		
23			90.8	35-3/4	11.1	4-3/8		
24	20.2	7-7/8	91.4	36	11.3	4-7/16		
25			90.8	35-3/4	11.4	4-1/2		
26	20.3	8	90.8	35-3/4	11.3	4-7/16		
27			91.4	36	11.3	4-7/16		
28			91.4	36	11.3	4-7/16	206.4	81-1/4
29			90.8	35-3/4	11.1	4-3/8	205.7	81
30			90.8	35-3/4	11.3	4-7/16	206.4	81-1/4
31			90.8	35-3/4	11.4	4-1/2		
32			91.4	36	11.4	4-1/2		
33			91.4	36	11.3	4-7/16	Not	Not
34			90.8	35-3/4	11.3	4-7/16	Tacked	Tacked
35			90.8	35-3/4	11.4	4-1/2		
36			90.8	35-3/4	11.3	4-7/16		
37			92.1	36-1/4*	11.3	4-7/16		
38			91.4	36	11.3	4-7/16		
39			90.8	35-3/4	11.3	4-7/16		
40			91.4	36	11.3	4-7/16	205.7	81
41				36-1/4	11.4	4-1/2	207.0	81-1/4
42			91.4	36	11.3	4-7/16	205.7	81
43			91.4	36	11.3	4-7/16		
44			91.4	36	11.1	4-3/8		
45			90.8	35-3/4	11.4	4-1/2		
46			90.8	35-3/4	11.1	4-3/8	Not	Not
47			90.8	35-3/4	11.1	4-3/8	Tacked	Tacked
48			90.8	35-3/4	11.1	4-3/8		
49			90.8	35-3/4	11.3	4-7/16		
50			90.8	35-3/4	11.3	4-7/16		
51			90.8	35-3/4	11.4	4-1/2		
52			91.4	36	11.1	4-3/8		
53			91.4	36	11.3	4-7/16		
54			91.4	36	11.1	4-3/8		
TENSION	NO SLACK		5 LBS.		1 LB.		5 LBS.	

\* #37 prior to measurement was tensioned to 15 lbs. Measured length at 15 lbs. was 37 inches.

P = 26.0 cm (10-1/4 inches)

#### ACCURACY

E+P = 227 cm (88-3/4 inches)

B, D, E+P, F measured closest .6 cm (1/4 inch)

G = 8.6 cm (3-3/8 inches)

A measured closest .3 cm (1/8 inch)

G, C measured closest .16 cm (1/16 inch)

For the 86378-1 parachutes, the measurements were taken at the skirt on gores #1, 4, 7 and 10.

A 2 inch diameter test area was used for each measurement. The material was not under any tension at the time of measurement.

Results of the measurements are shown in Table XIII.

5. Conclusions and Recommendations

The following conclusions and recommendations are made concerning the program.

- a. A fabrication technique was developed to produce scale parachutes that conform to the drawings. This technique involves use of a tooling aid that allows fabrication of the drag producing surface with a minimum of handling small lengths of ribbon. This tooling aid also allows for quick and accurate placement of the horizontal ribbons with the correct gap.
- b. Sufficient dimensional data and porosity measurement were taken on each canopy to interpret the wind tunnel results.
- c. This type of fabrication technique is recommended as a guide in fabrication of similar type scale parachutes.



Table XIII - Frasier Diffusion Test Results At A  
Pressure Differential of 1/2 Inch Water

P/N	S/N	% Porosity
86375-1	001	14.7
	002	13.9
	003	12.4
86376-1	001	22.3
	002	21.8
	003	22.0
86378-1	001	22.9
	002	24.0

APPENDIX A

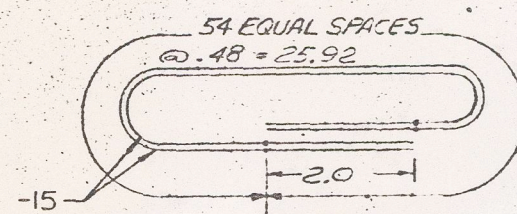
Drawings of the Scale Drogue Parachute, Pilot  
Parachute and Deployment Bags.

This envelope contains drawing 86375  
Parachute Assembly 20° Conical Ribbon,  
6.75 Ft Do, 16% porosity.

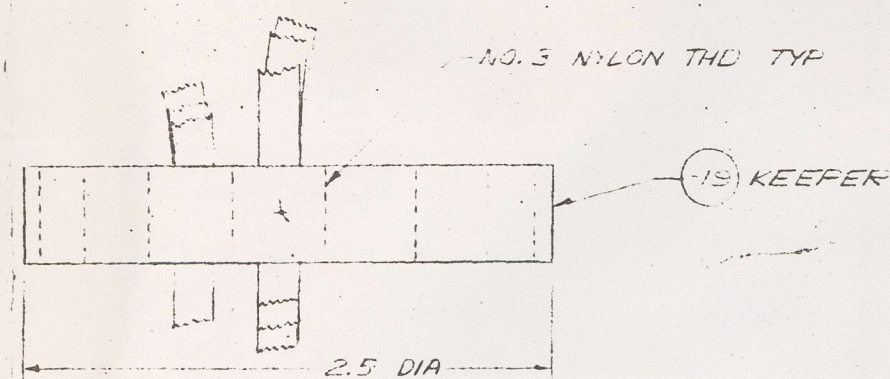
Note: See tables I and II for modification incorporated  
into the fabricated parachutes.



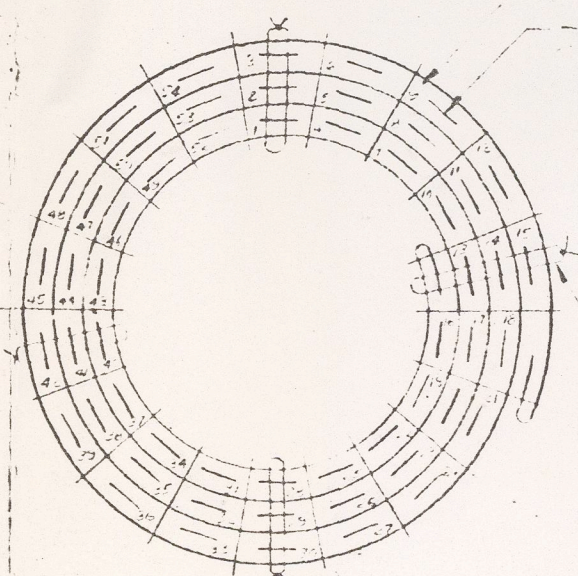
- | REVISIONS |     |             |      |          |
|-----------|-----|-------------|------|----------|
| ZONE      | LTR | DESCRIPTION | DATE | APPROVED |
|           |     |             |      |          |



(5) GORE ASSY  
54 REQD  
(SEE DETAIL ZONE IIA)



240



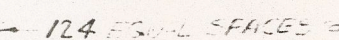
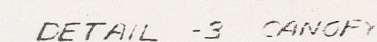
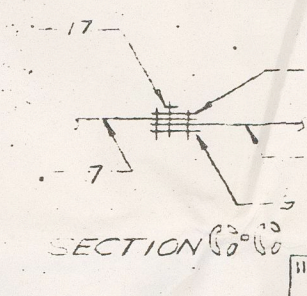
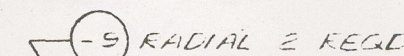
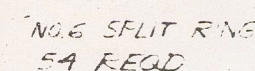
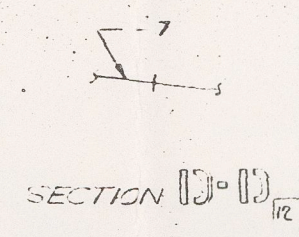
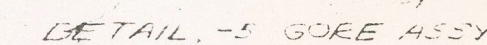
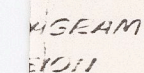
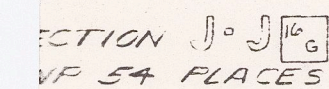
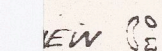
SEE VIEW H  
(ZONE 19 D)

SECTION 15.05

FRAME 1 OF 4

[illegible][illegible]





BACKSTITCH - A  
VERTICAL TR



24

23

22

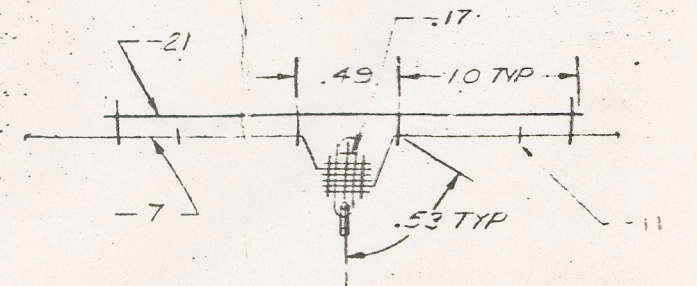
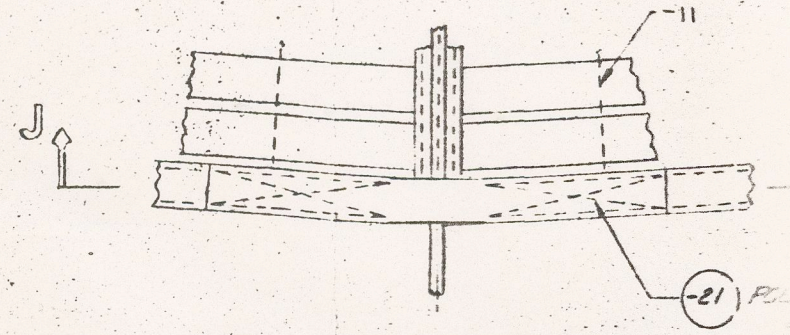
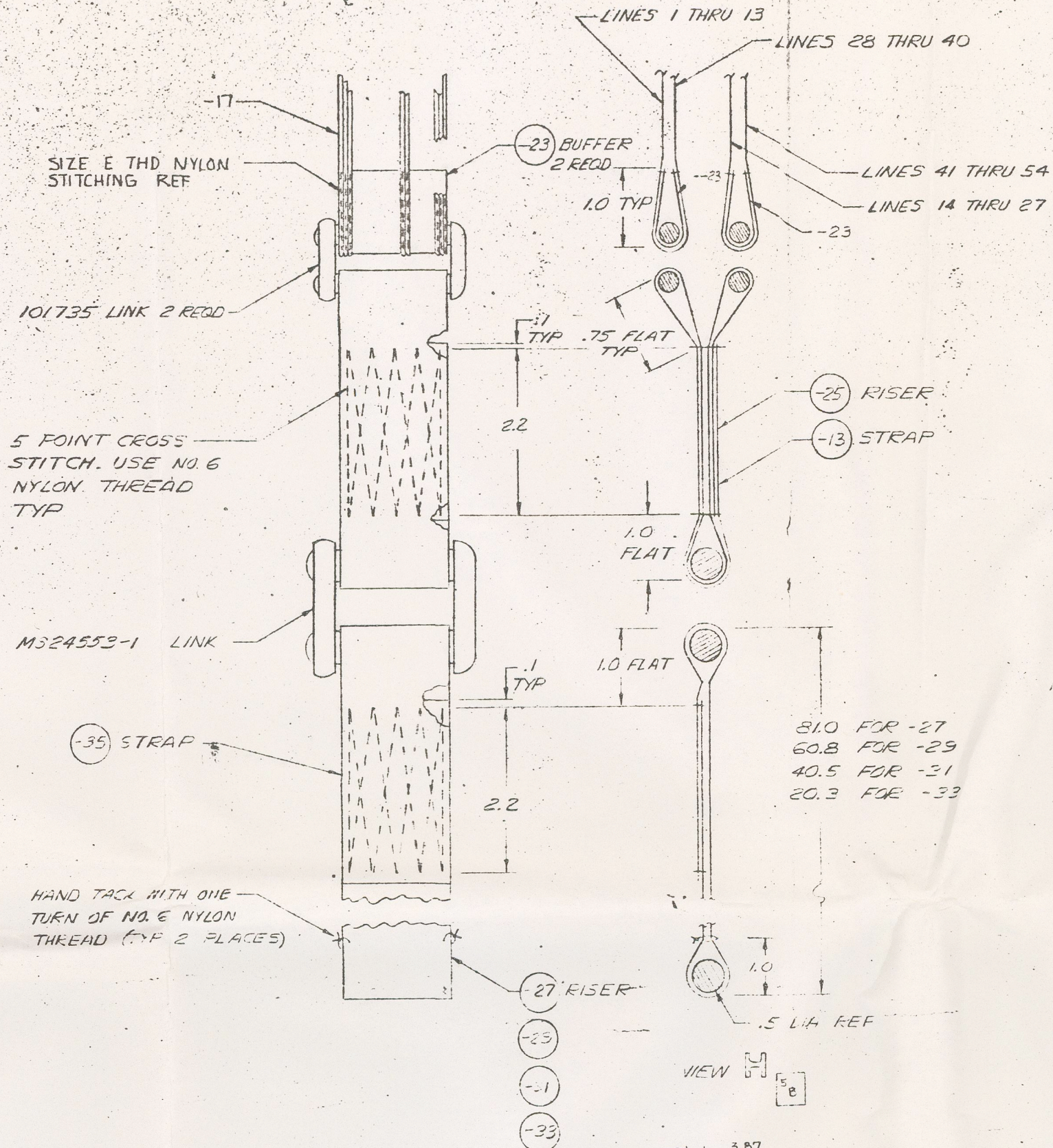
21

20

19

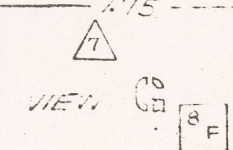
18

17



DOUBLE CHINESE FINGER JOINT  
TYP 14 PLACES

HAND TACK TACK WITH FIGURE 8  
STITCH USING E THD NYLON



-17 SUSPENSION LINE MARKING DIAGRAM  
MARK UNDER 5 LBS TENSION

FRAME 3 OF 4

86395

30-5

24

23

22

21

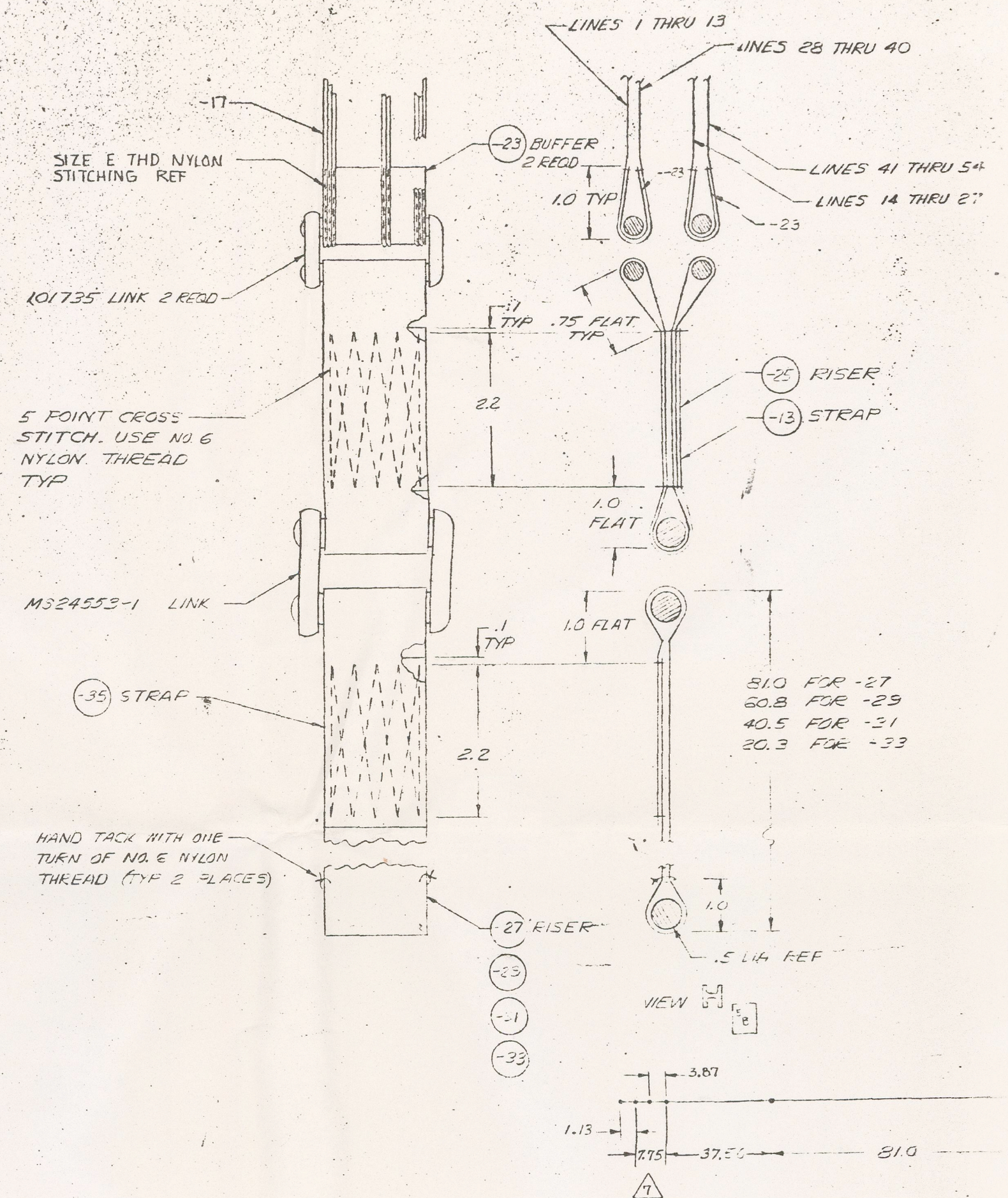
20

19

18

17





30-5



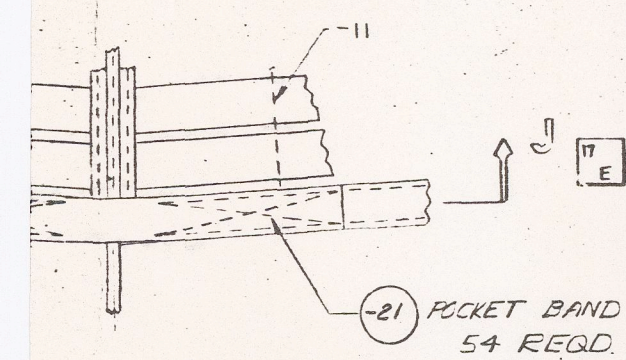
This envelope contains drawing 86376  
Parachute Assembly, 20° Conical Ribbon,  
.6.75 Ft Do, 24% Porosity.

Note: See table III for modifications incorporated  
into the fabricated parachutes.

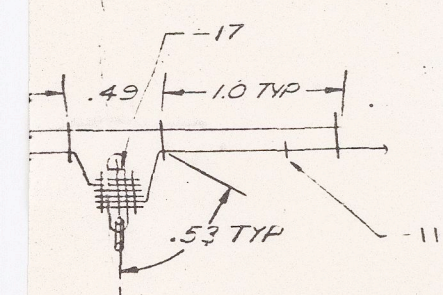




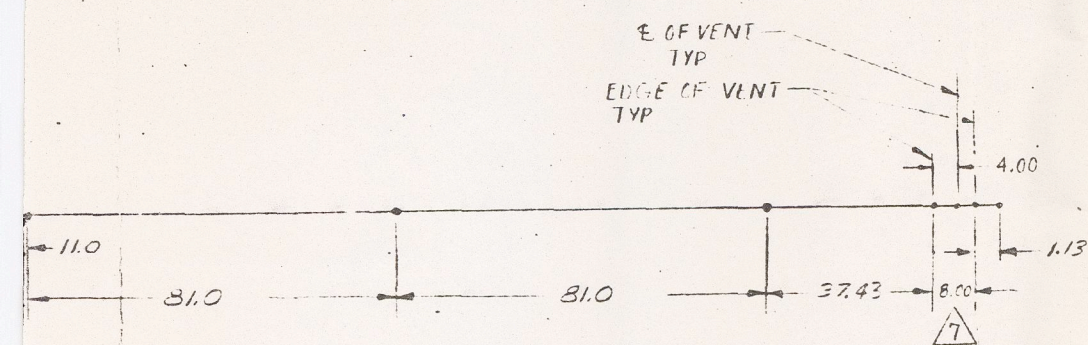




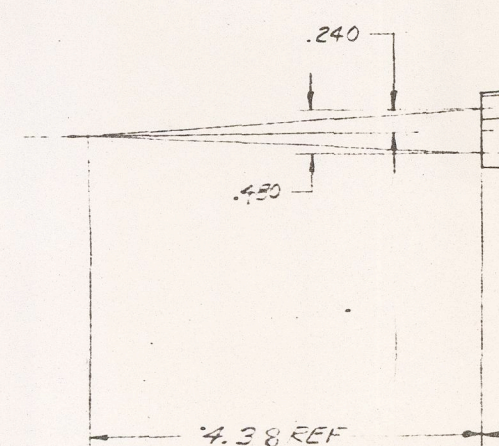
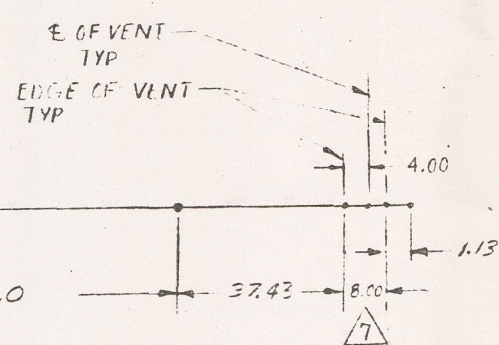
VIEW C



SECTION J-J  
54 PLACES



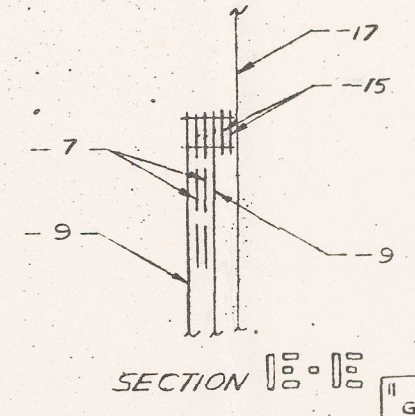
MARKING  
DIAGRAM



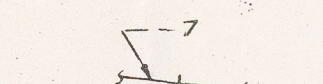
ATTACH REEFING RING  
WITH 3 TURNS OF NO. 3  
CORD NYLON THREAD

NO. 6 SPLIT RING  
54 REQD

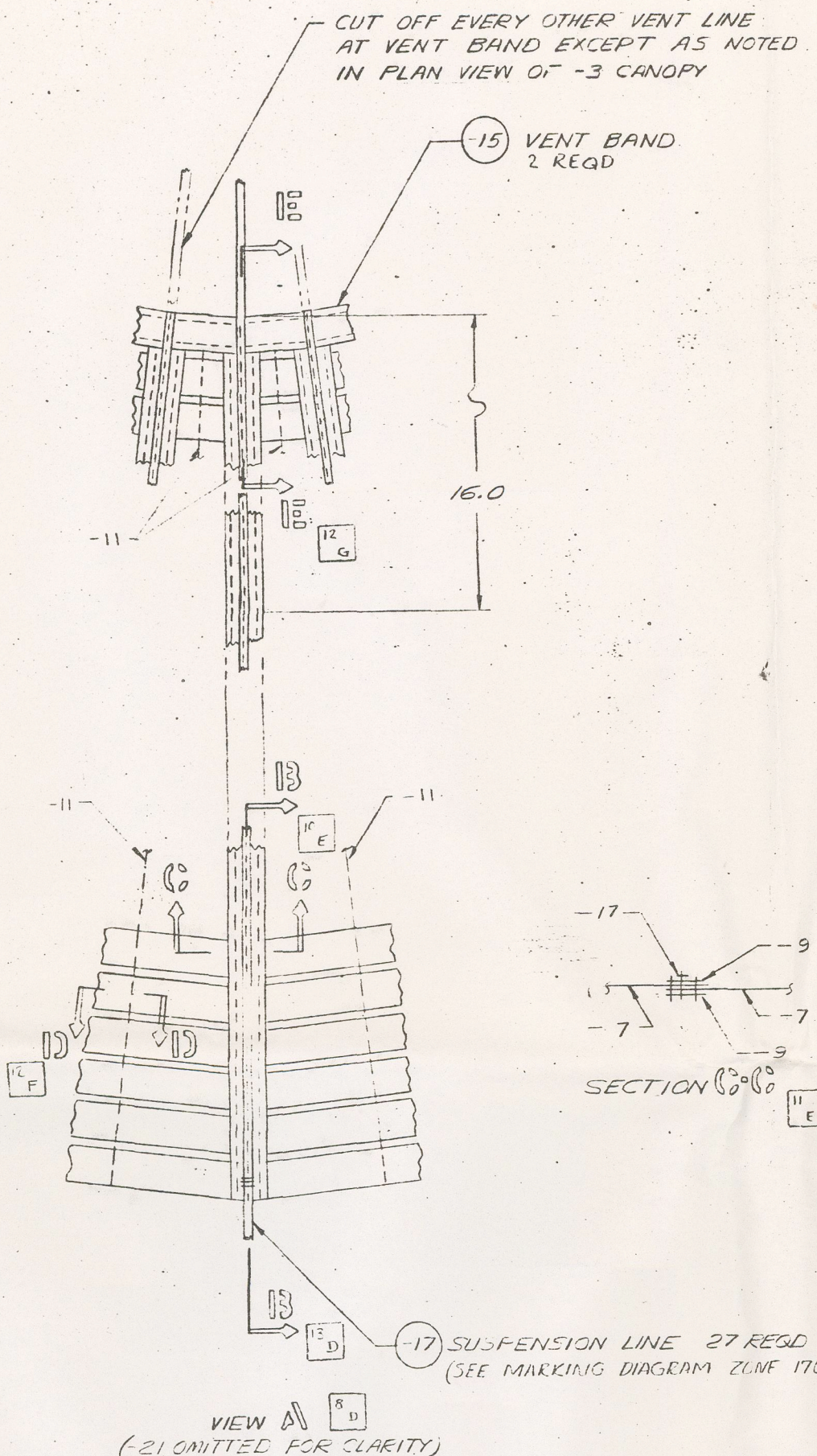
SECTION 13-13  
11 D



SECTION 13-13  
11 E



SECTION 13-13  
11 E



VIEW A  
(-21 OMITTED FOR CLARITY)

(-9) RADIAL 2 REQD

(-11) SUSPENSION LINE 27 REQD  
(SEE MARKING DIAGRAM ZONE 17C)

(-7) HORIZONTAL 11 REQD

(-11) VERTICAL 7 REQD  
(SIZE E NYLON 110)

(-11) VERTICAL 7 REQD  
(SIZE E NYLON 110)

(-11) VERTICAL 7 REQD  
(SIZE E NYLON 110)

(-11) VERTICAL 7 REQD  
(SIZE E NYLON 110)

(-11) VERTICAL 7 REQD  
(SIZE E NYLON 110)

CUT OFF EVERY OTHER VENT LINE  
AT VENT BAND EXCEPT AS NOTED  
IN PLAN VIEW OF -3 CANOPY

(15) VENT BAND  
2 REQD

(15) VENT BAND  
2 REQD

(15) VENT BAND  
2 REQD

(15) VENT BAND  
2 REQD

(15) VENT BAND  
2 REQD

(15) VENT BAND  
2 REQD

(15) VENT BAND  
2 REQD

(15) VENT BAND  
2 REQD

(15) VENT BAND  
2 REQD

(15) VENT BAND  
2 REQD

(15) VENT BAND  
2 REQD

(15) VENT BAND  
2 REQD

(15) VENT BAND  
2 REQD

(15) VENT BAND  
2 REQD

(15) VENT BAND  
2 REQD

(15) VENT BAND  
2 REQD

(15) VENT BAND  
2 REQD

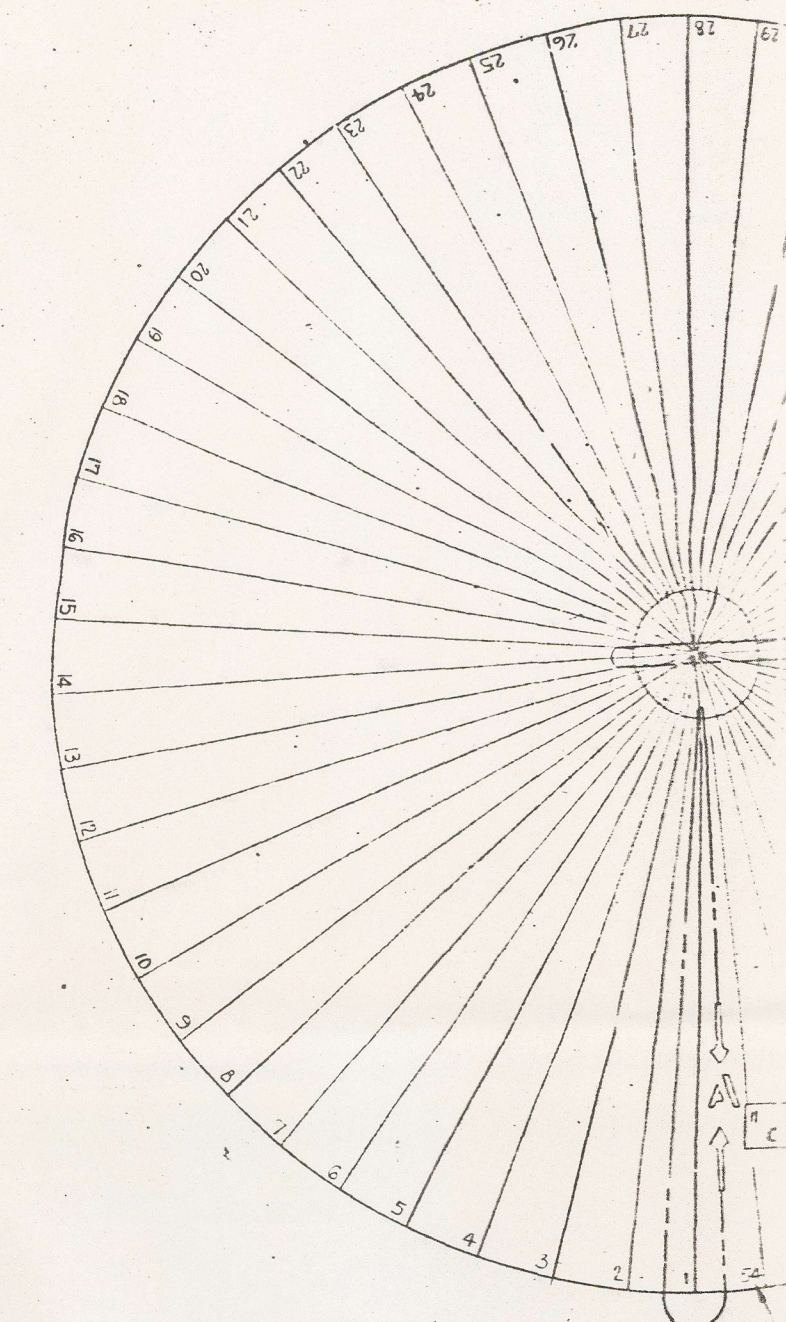
(15) VENT BAND  
2 REQD

(15) VENT BAND  
2 REQD

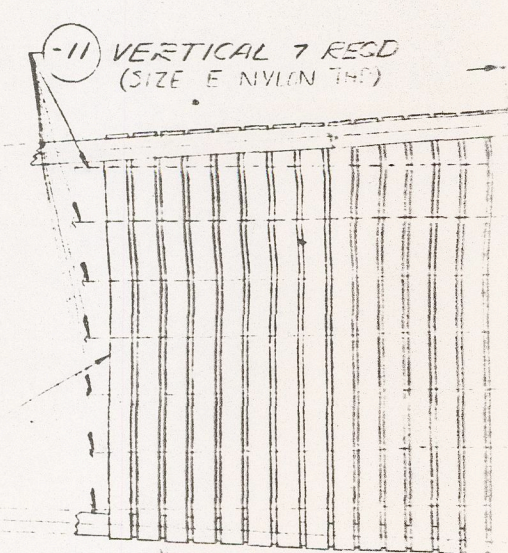
(15) VENT BAND  
2 REQD

(15) VENT BAND  
2 REQD

(15) VENT BAND  
2 REQD



DETAIL -3 CANOPY



110 EQUAL SPACES

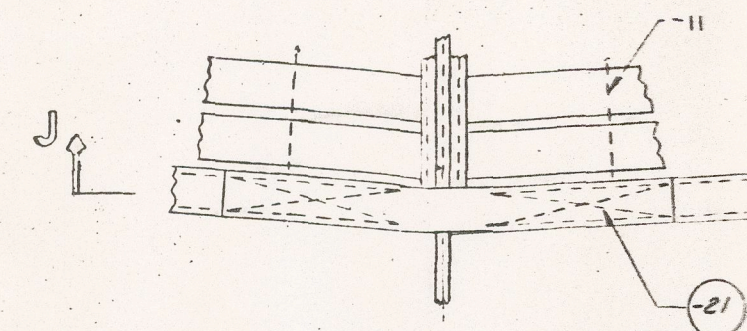
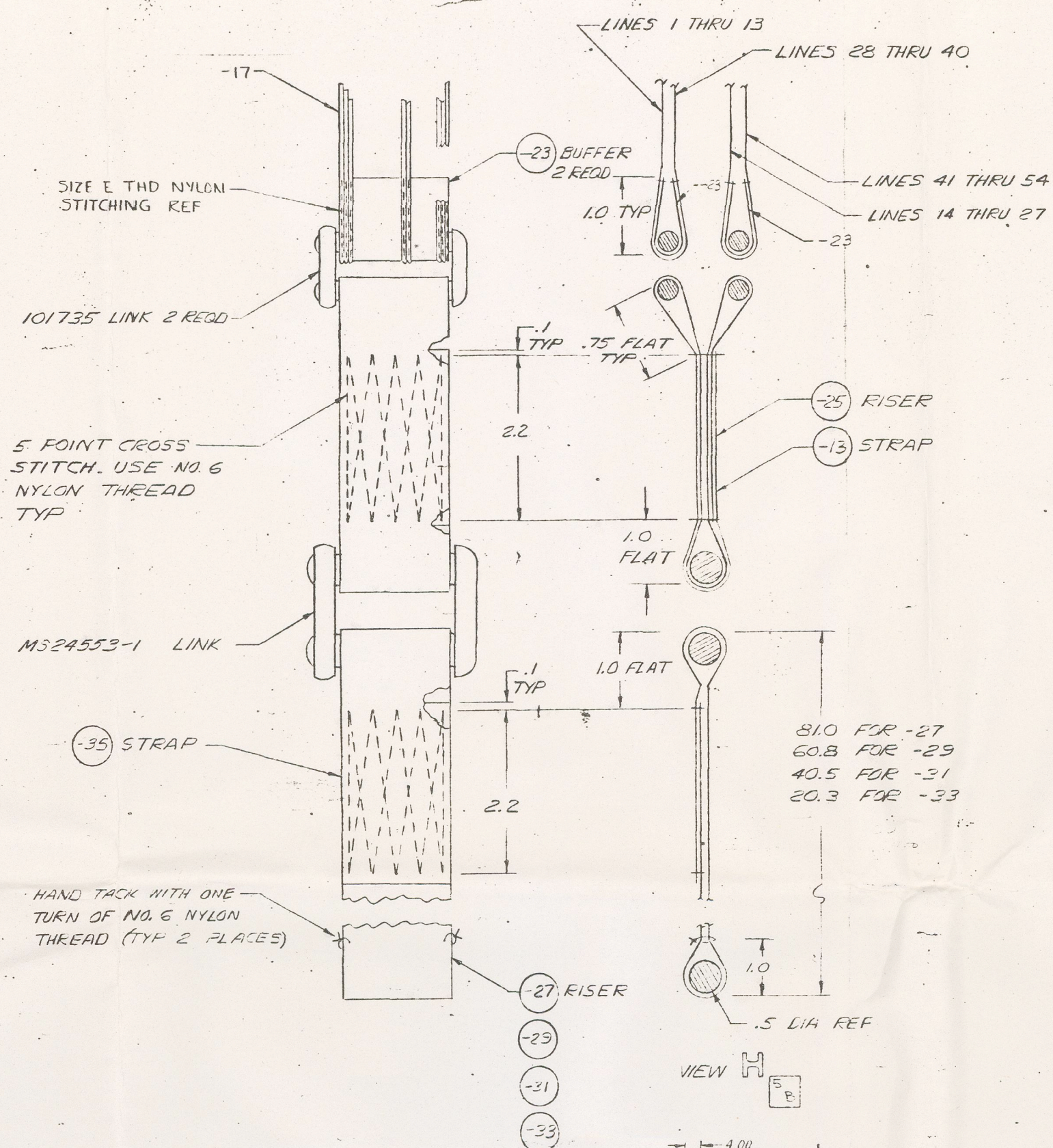
DETAIL -5 GORE ASSY

FRAME 2 OF 4

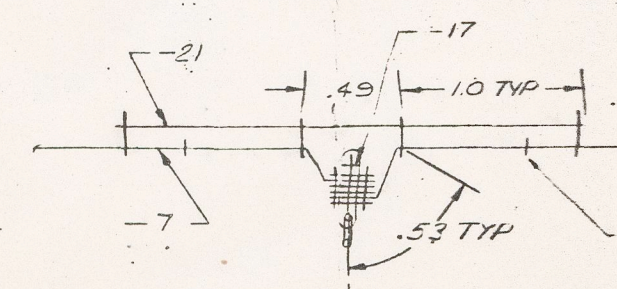
86374

30-5

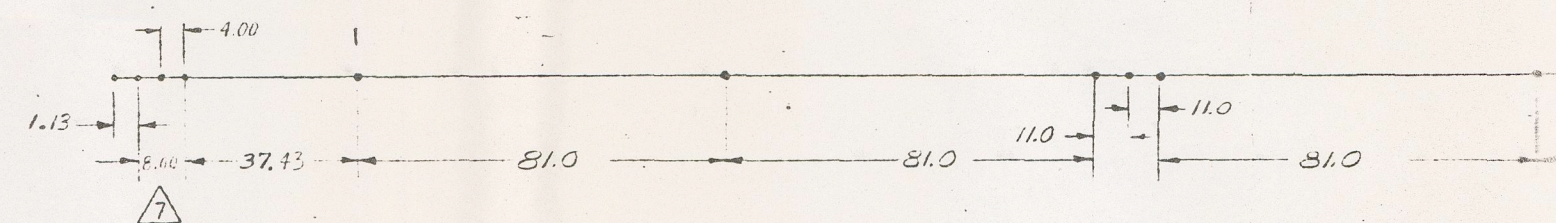




VIEW C

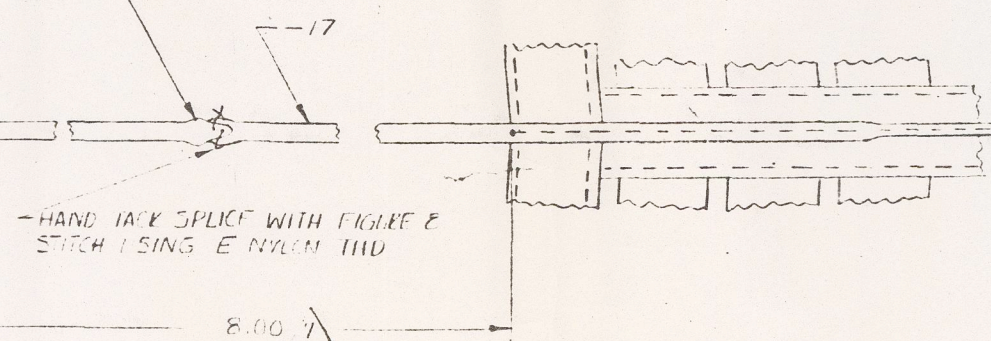


SECTION J-J  
TYP 54 PLACES



-17 SUSPENSION LINE MARKING DIAGRAM  
MARK UNDER 5 LBS TENSION

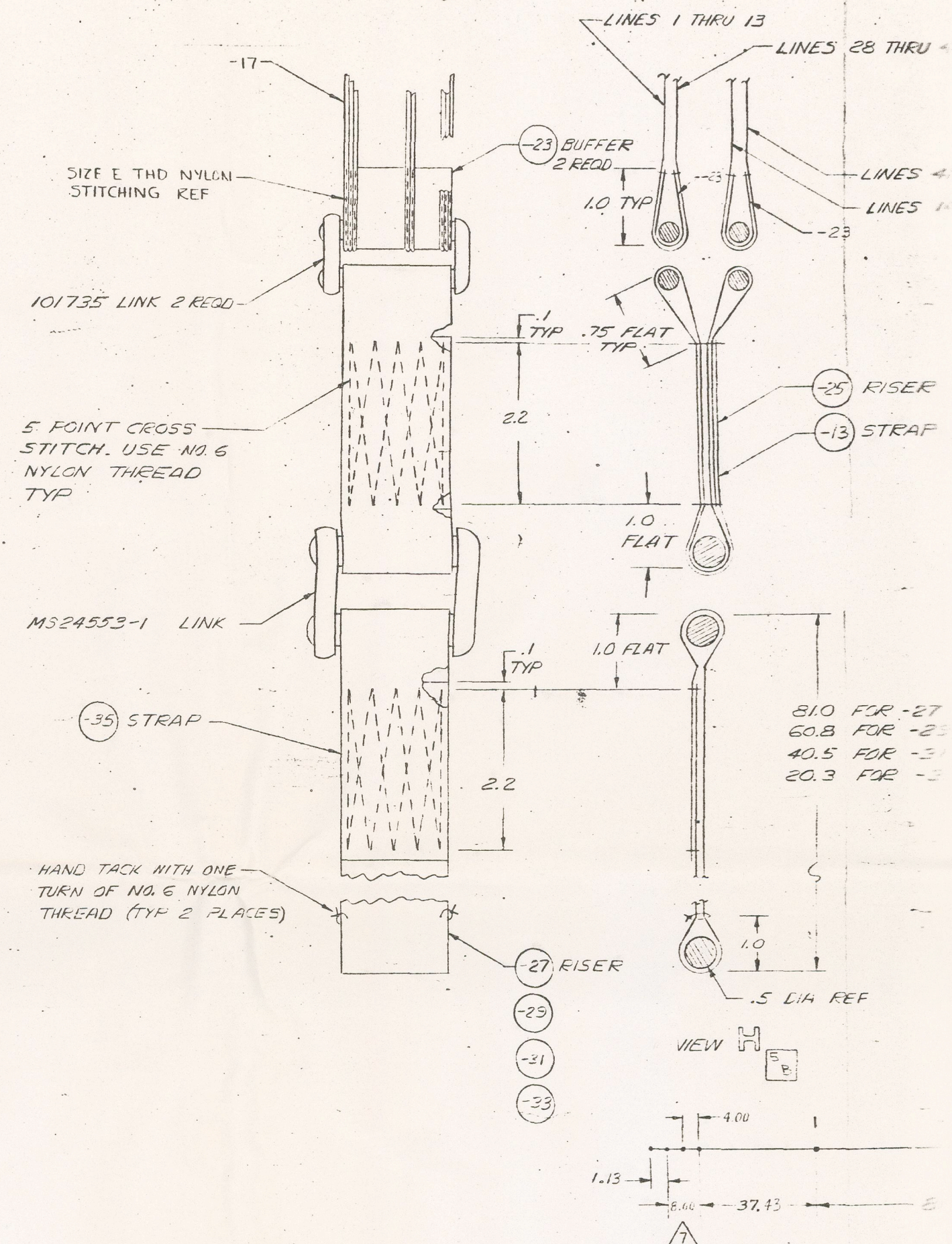
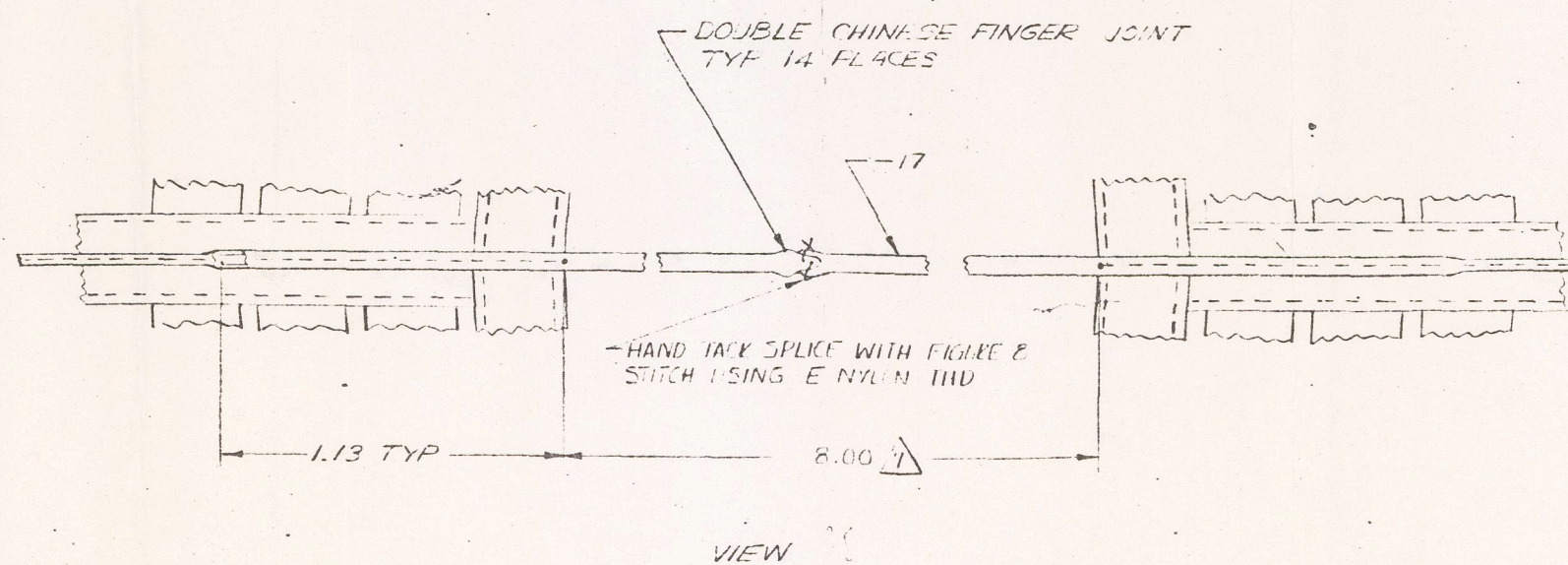
DOUBLE CHINESE FINGER JOINT  
TYP 14 PLACES



VIEW



H  
G  
F  
E  
D  
C  
B  
A



FRAME 4 OF 4

30-5

86376

26 25 24 23 22 21 20 19

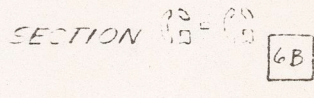


This envelope contains drawing 86377  
Deployment Bag, Drogue Parachute

Note: See Table IV for modifications incorporated  
into the fabricated parachutes.

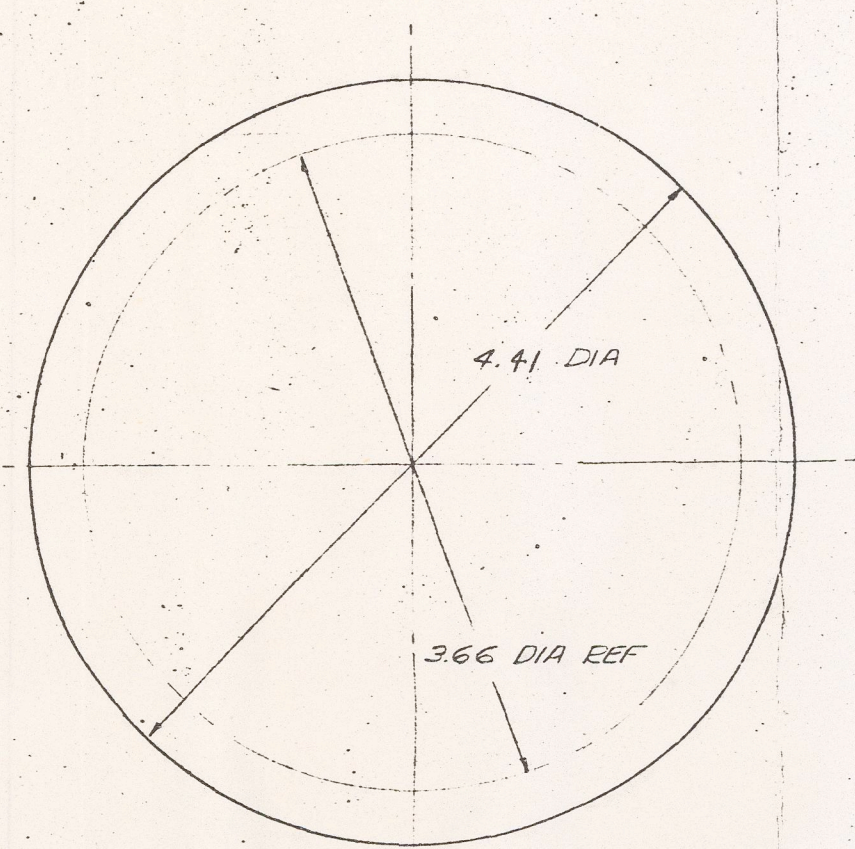


6. MIN. E.D. FOR STITCHING OF TAPES AND WEBBINGS .06  
7. RUBBER STAMP THE FOLLOWING ON OUTSIDE OF BAG IN .12-.25 CHARACTERS:  
PART NAME, PART NO., SERIAL NO., DATE OF MFG, NAME OF MANUFACTURER

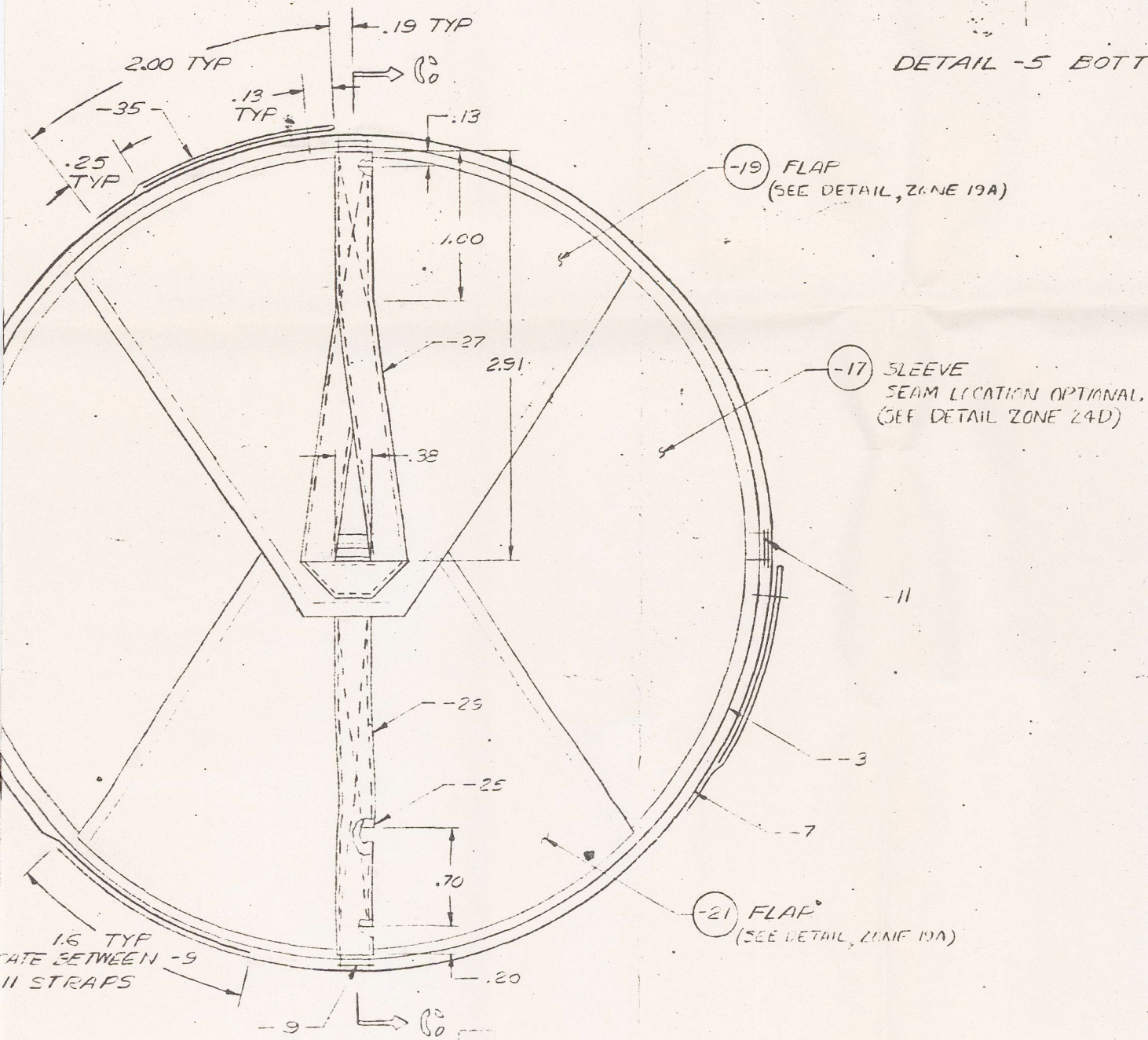


-2- -1		CODE	IDENTIFYING NO.	OR DESCRIPTION	SPECIFICATION	OR NOTE	ZONE	NO.
REQ. PER ASY				PARTS LIST				
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES				CONTRACT NO.				
ANGULAR TOLERANCE				DATE				
LINEAR - HUNDREDTHS ± .000				TITL				
THOUSANDTHS ± .010				DEFLATION BAGS				
ON SHEET METAL PARTS				DROGUE PARACHUTE,				
ALL BEND RADIUS INSIDE CORNER				(1/8 SCALE OF 54" X 40" PARACHUTE)				
RADIUS OUTSIDE CORNERS 2"								
RADIUS CIRCULAR THICK ARE MINIMUM								
SQUARE REQUIREMENTS								
INDICATES SURFACE				SIZE				
ROUGHNESS PER USAS D401				CODE IDENT NO.				
NEXT ASY				NO.				
USED ON				J 77646				
FABRICATE PER SPEC				SCALE				
CUSTOMER				SHEET OF				

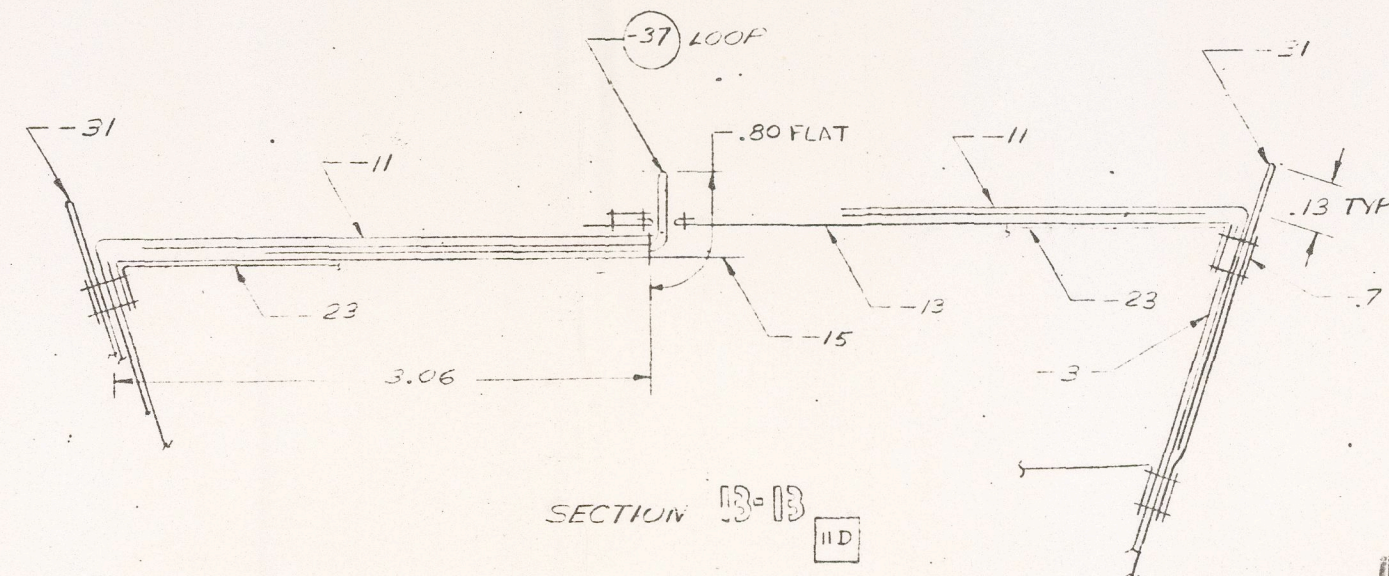
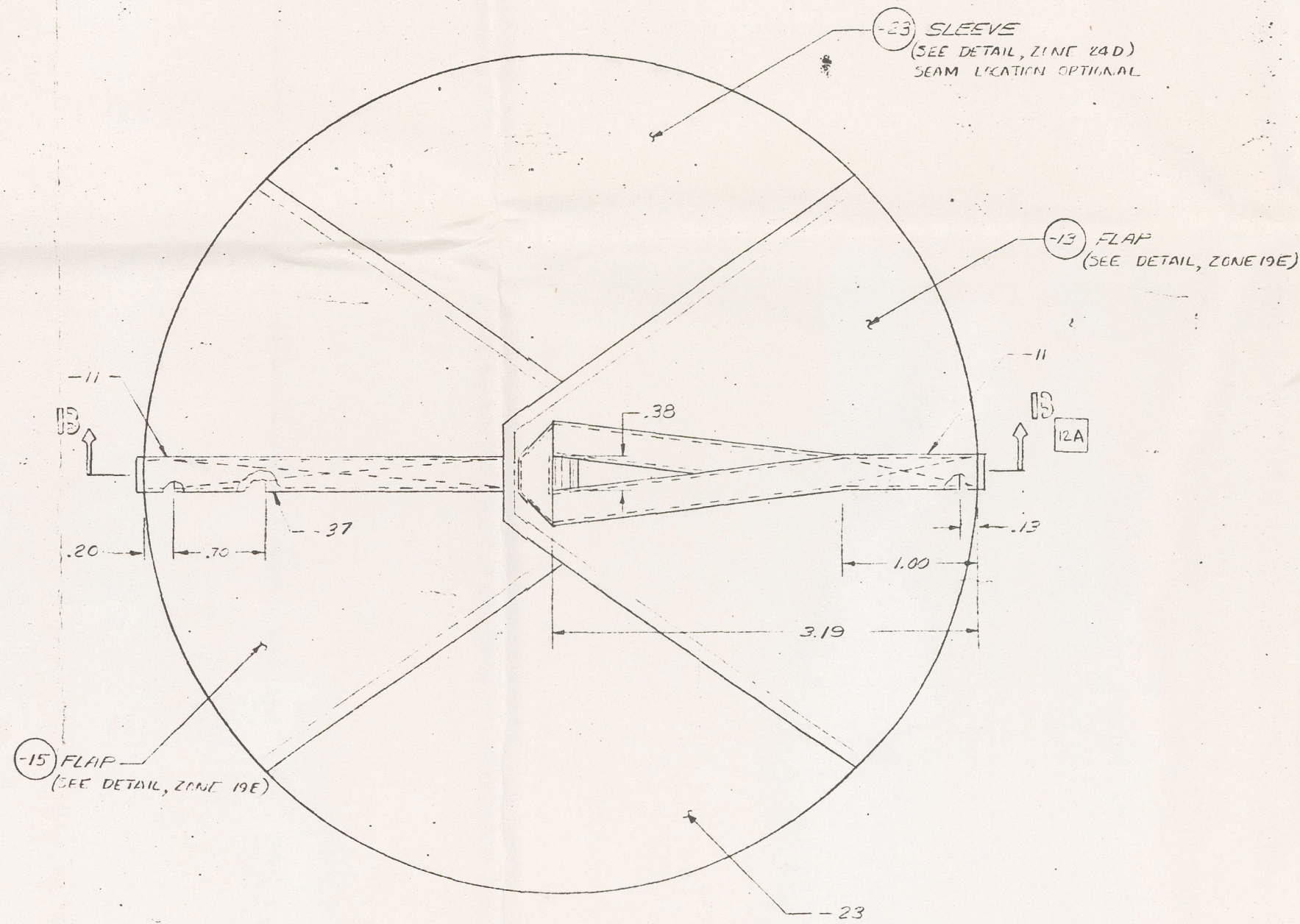




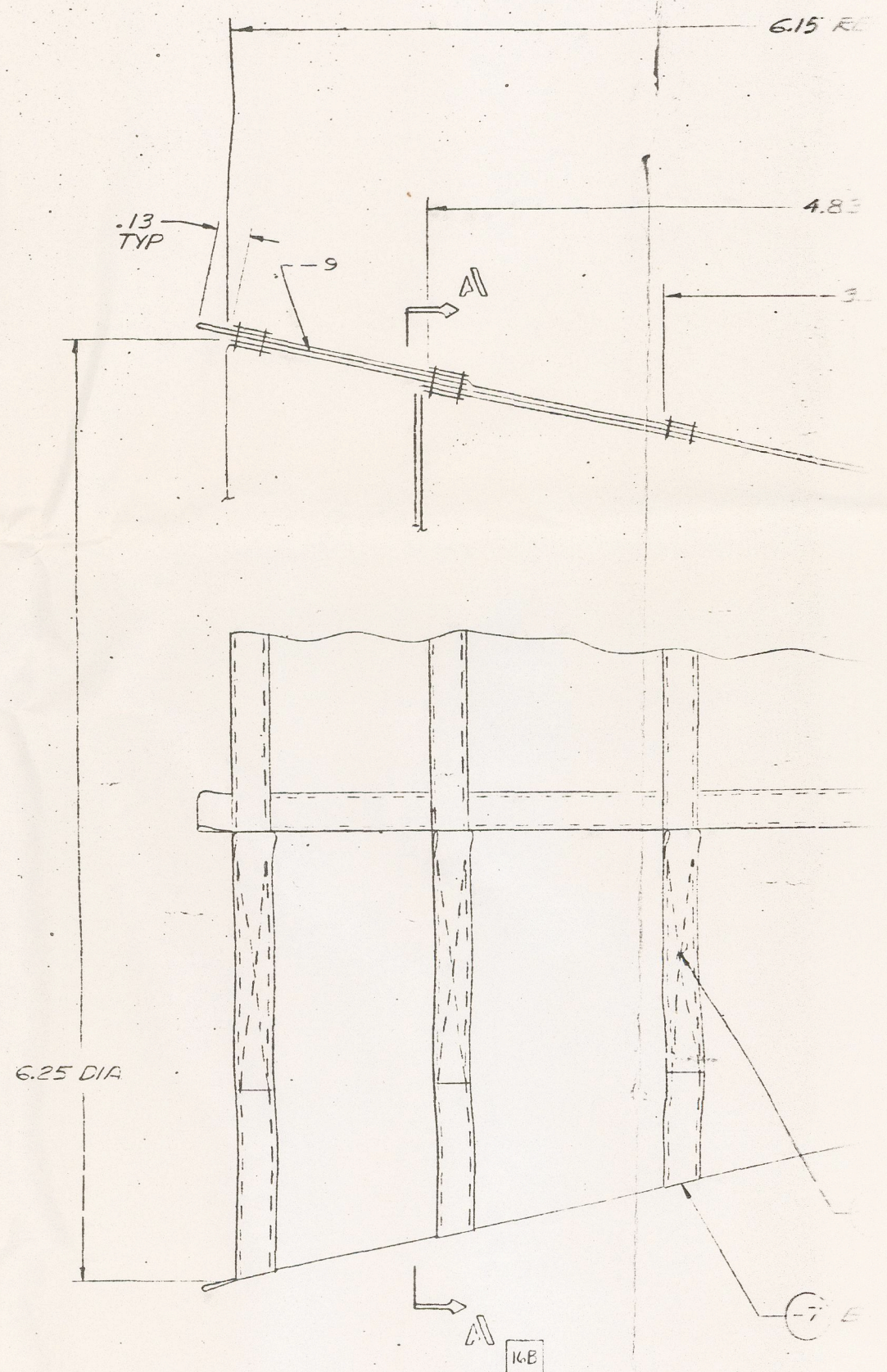
DETAIL -5 BOTTOM 7E



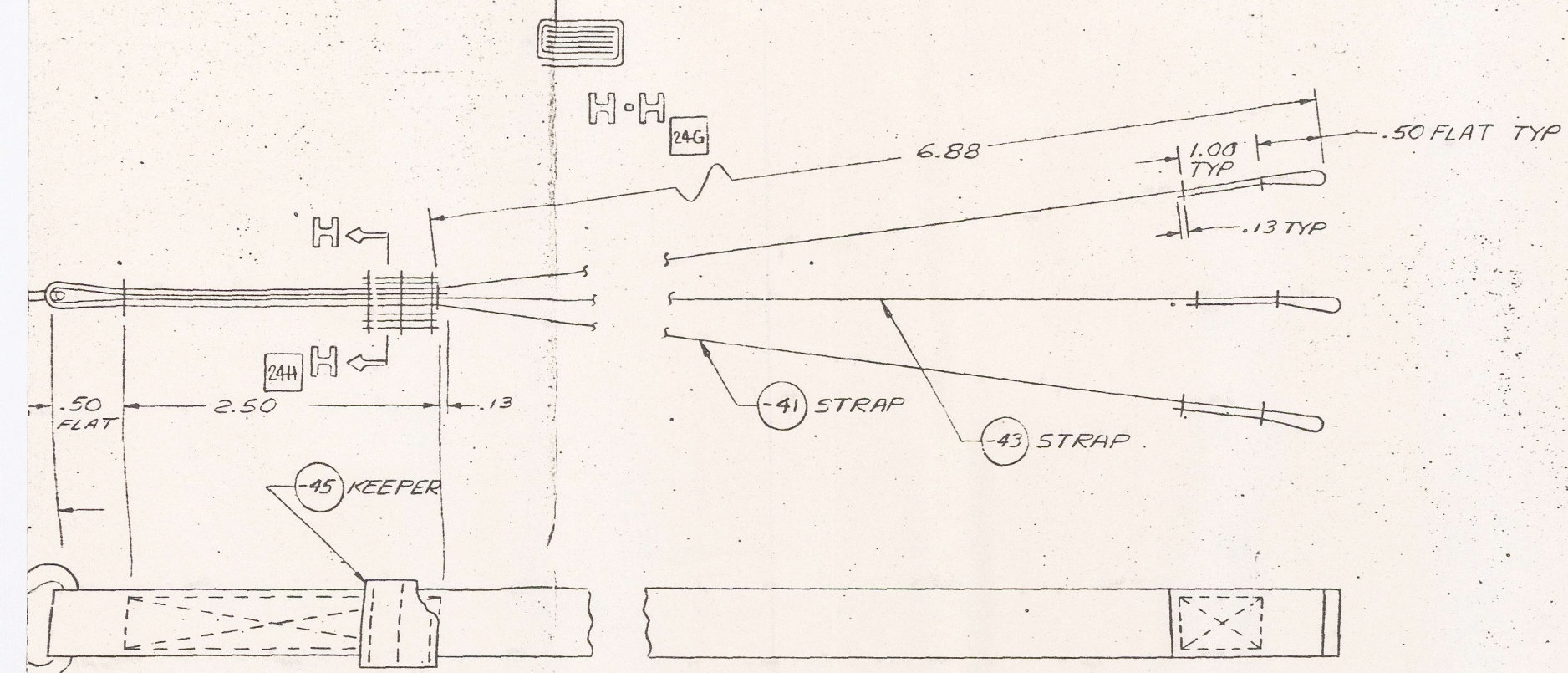
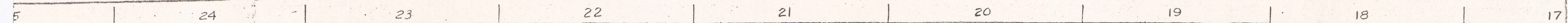
SECTION A-A 9C



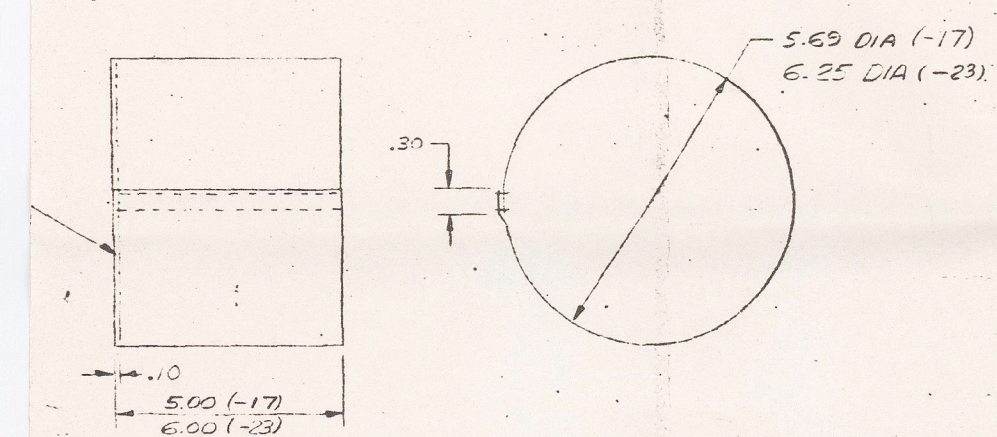
SECTION B-B 11D



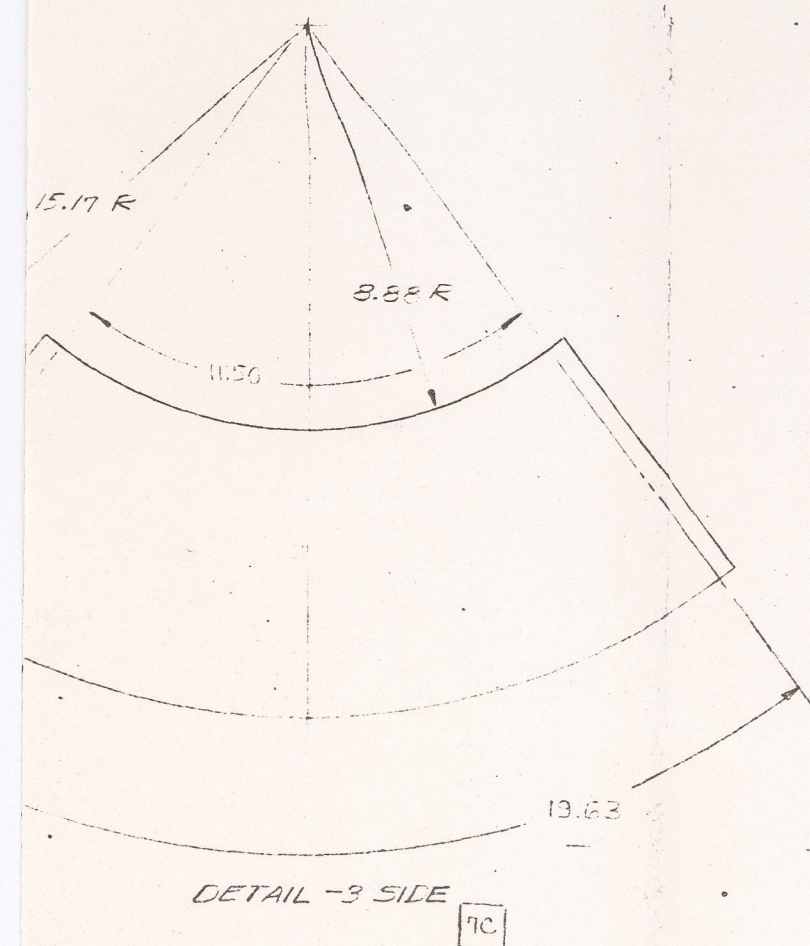




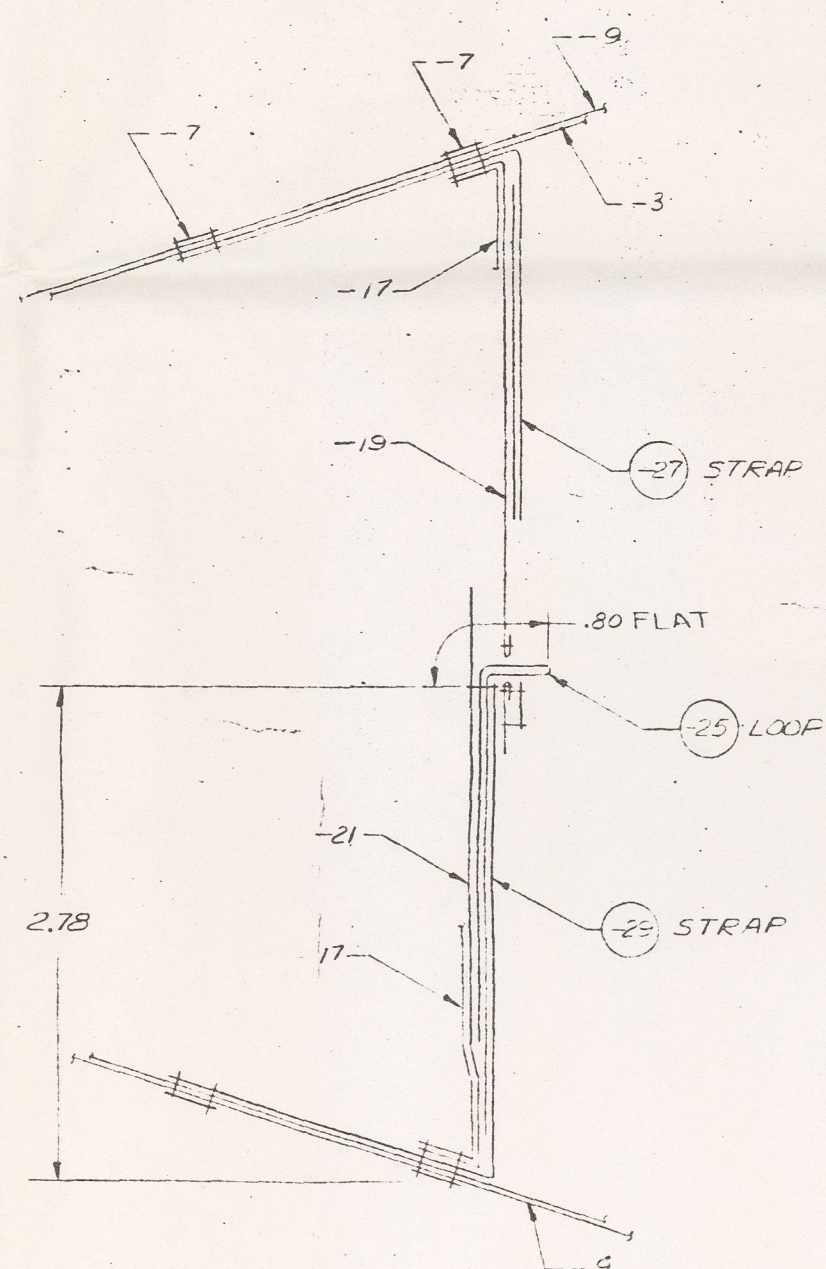
DETAIL -39 BRIDLE ASSY



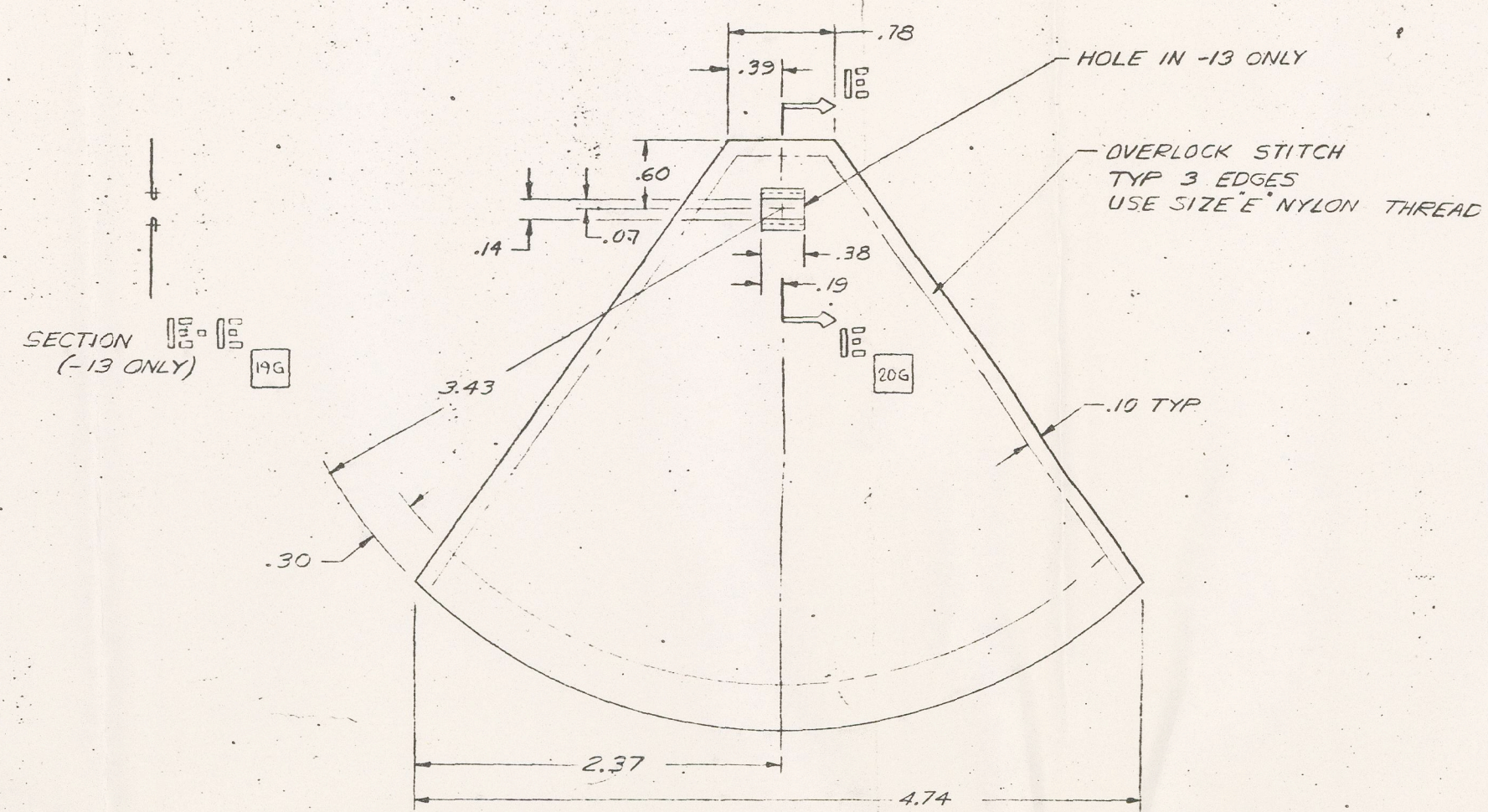
DETAIL -17 & -23 SLEEVE



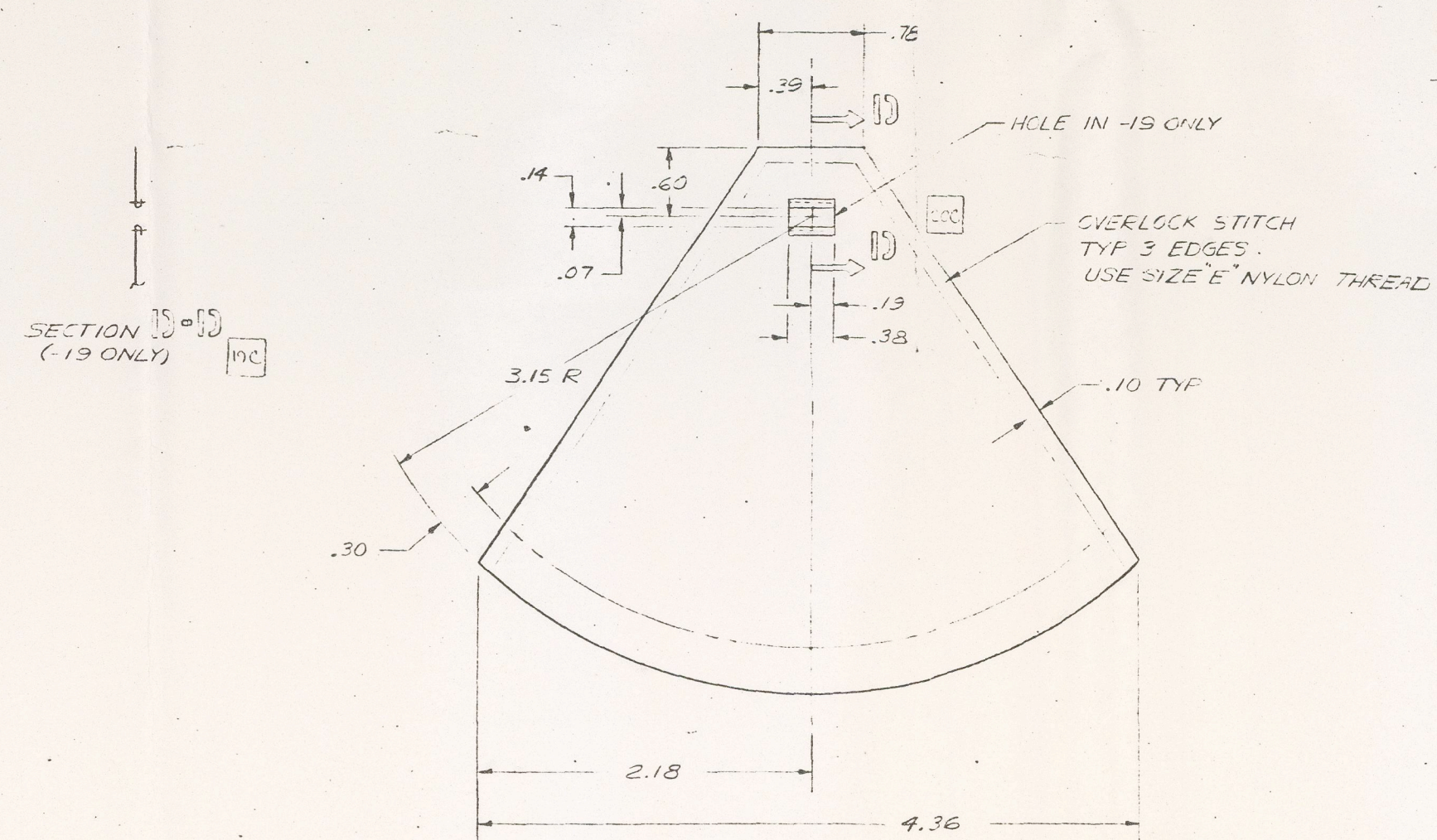
DETAIL -3 SIDE



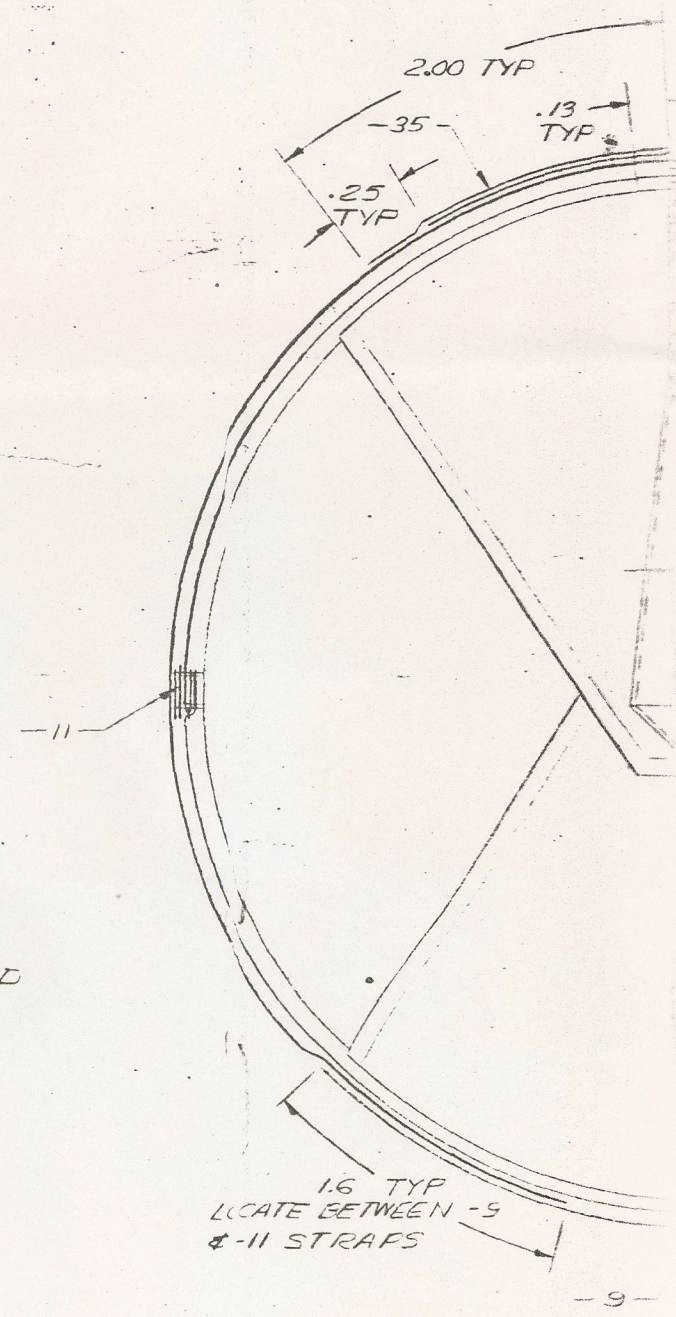
SECTION 6-6



DETAIL -13 & -15 FLAP



DETAIL - 19 & 21 FLAP



SECTION



26

25

24

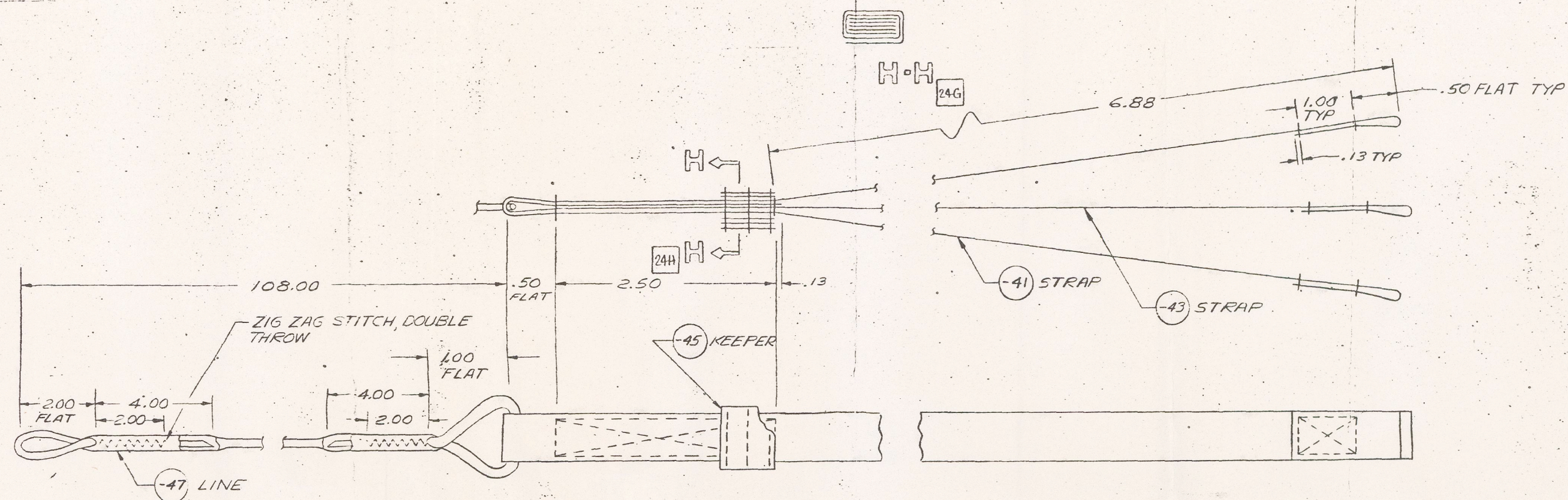
23

22

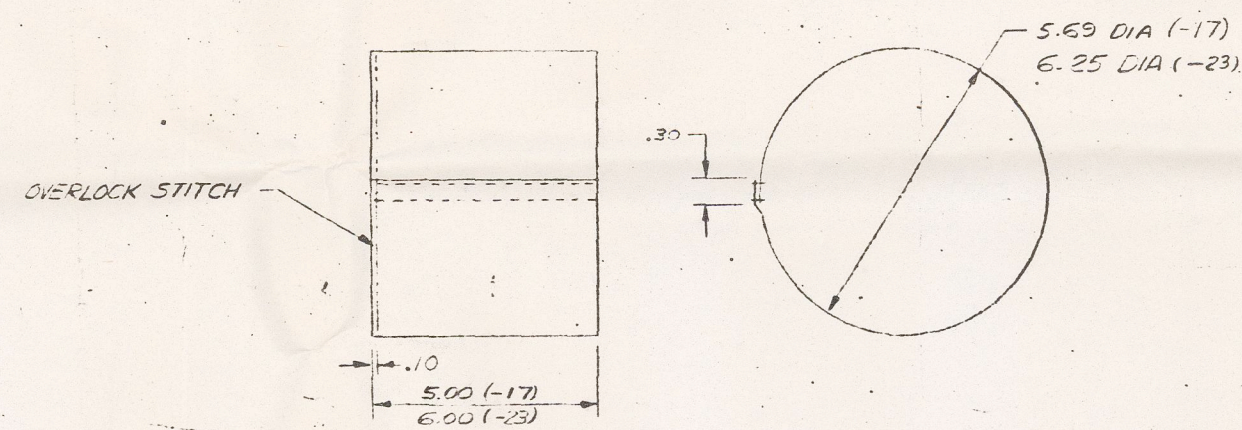
21

20

19

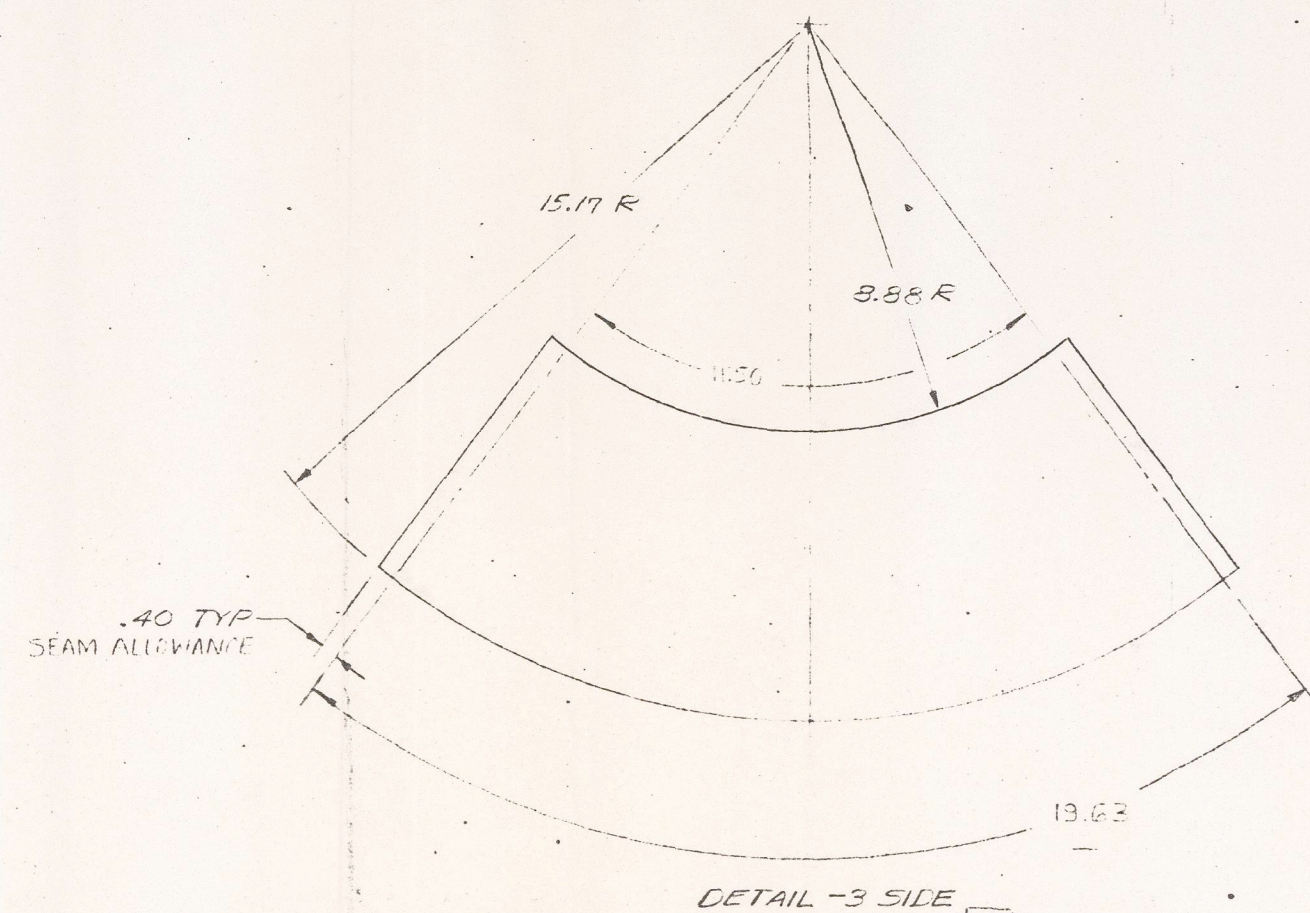


DETAIL -39 BRIDLE ASSY



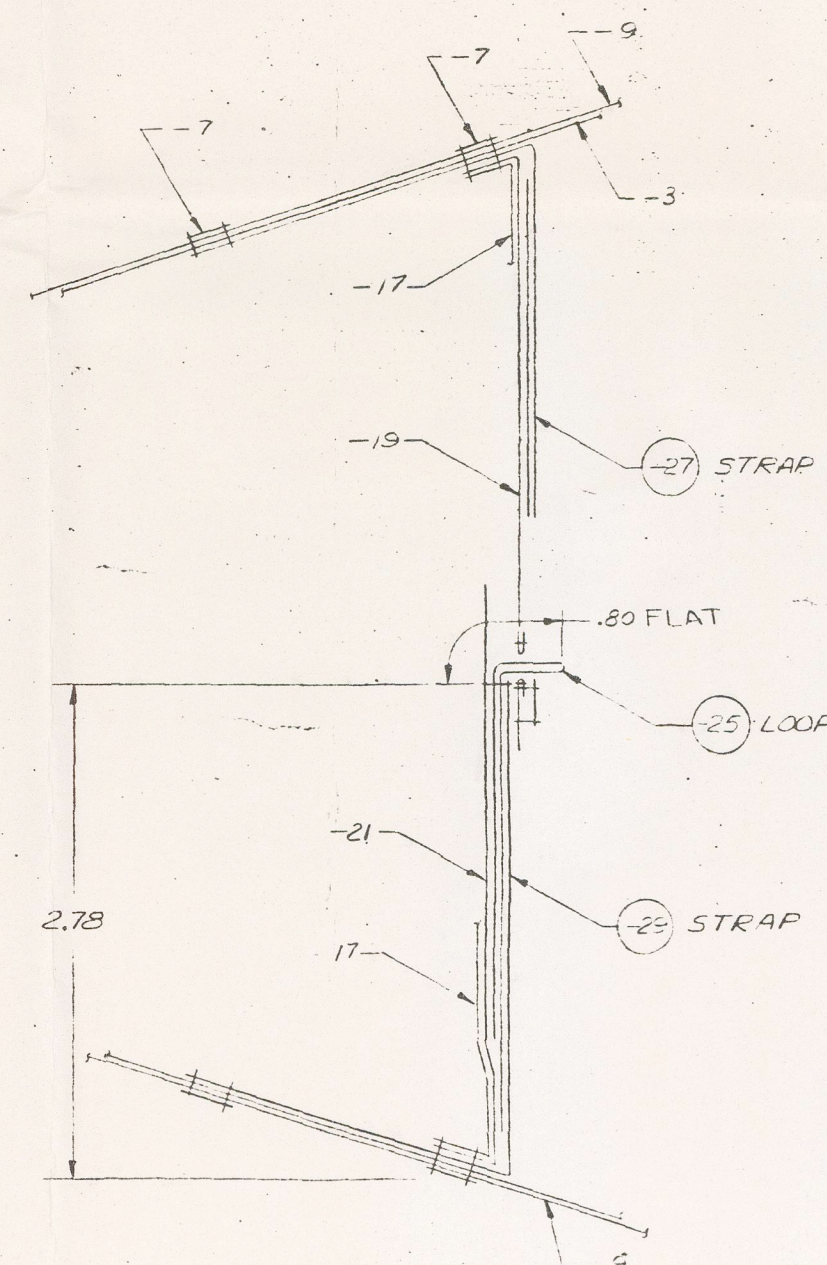
DETAIL -17 &amp; -23 SLEEVE

14D 11E



DETAIL -3 SIDE

7C

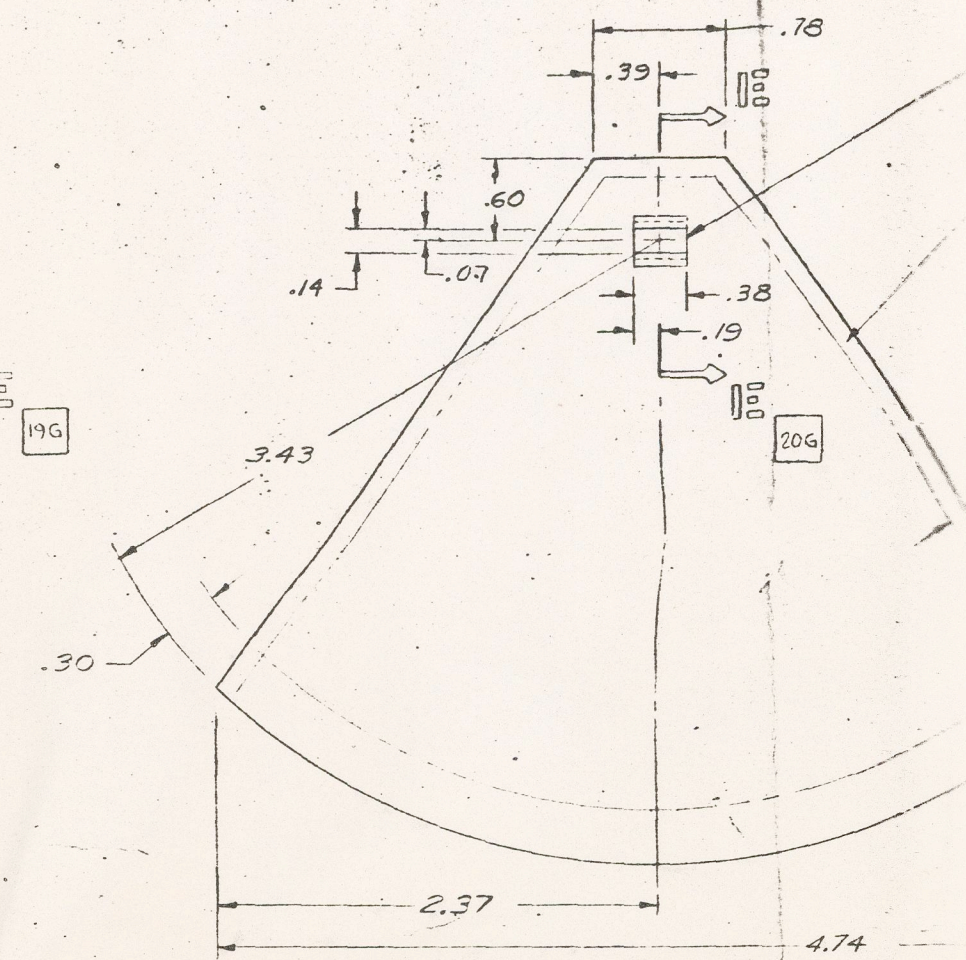


SECTION 10-15

16E

SECTION 10-13

(-13 ONLY)



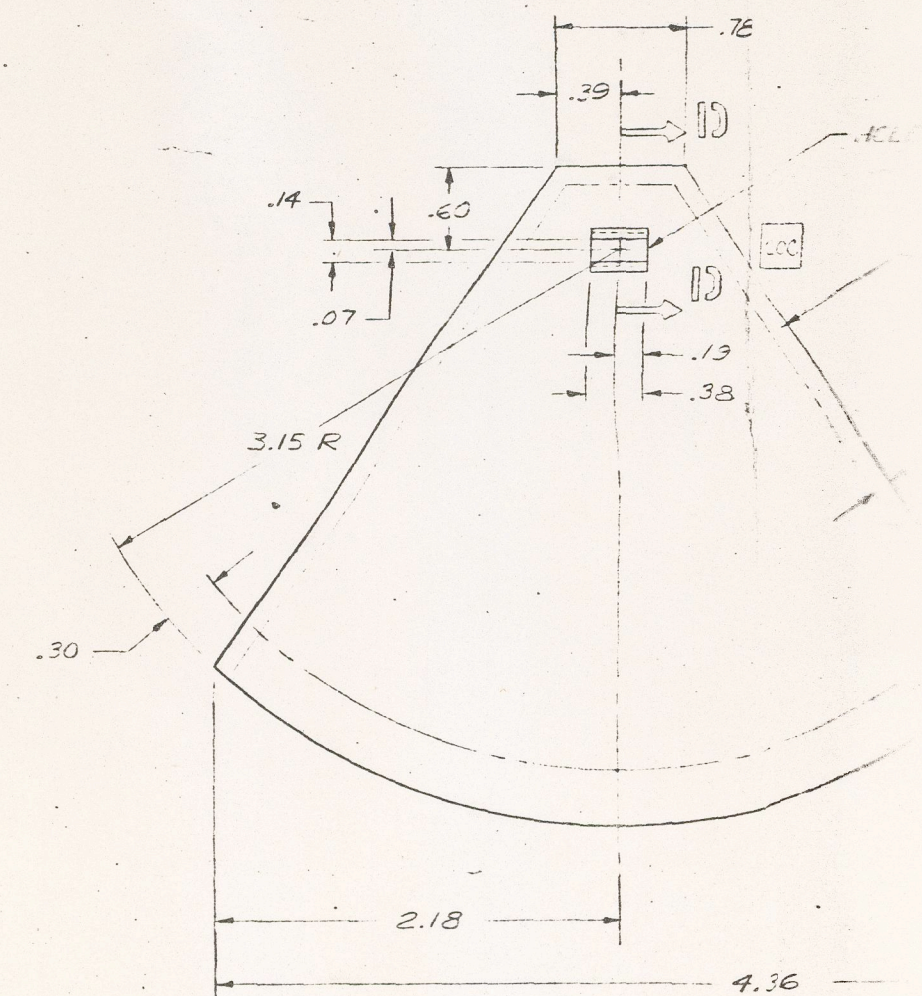
DETAIL -13 &amp; -15 FLAP

11E

SECTION 10-19

(-19 ONLY)

11C



DETAIL -19 &amp; -21 FLAP

15E 12E

FRAME 4 OF 4

86377

30-5

26

25

24

23

22

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19



This envelope contains drawing 86378  
Parachute Assembly, 20° Conical Ribbon,  
1.0 Ft Do, 24% Porosity

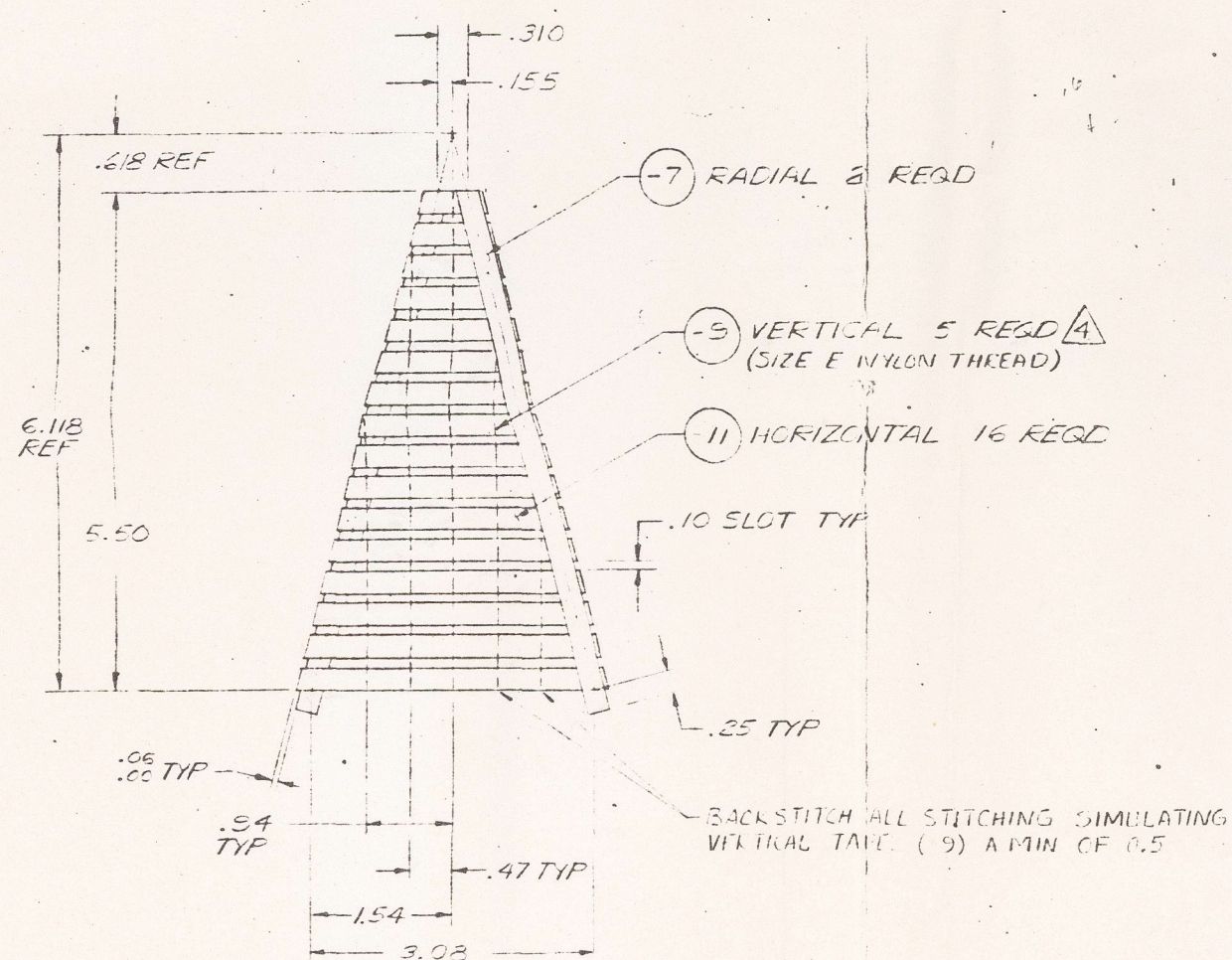
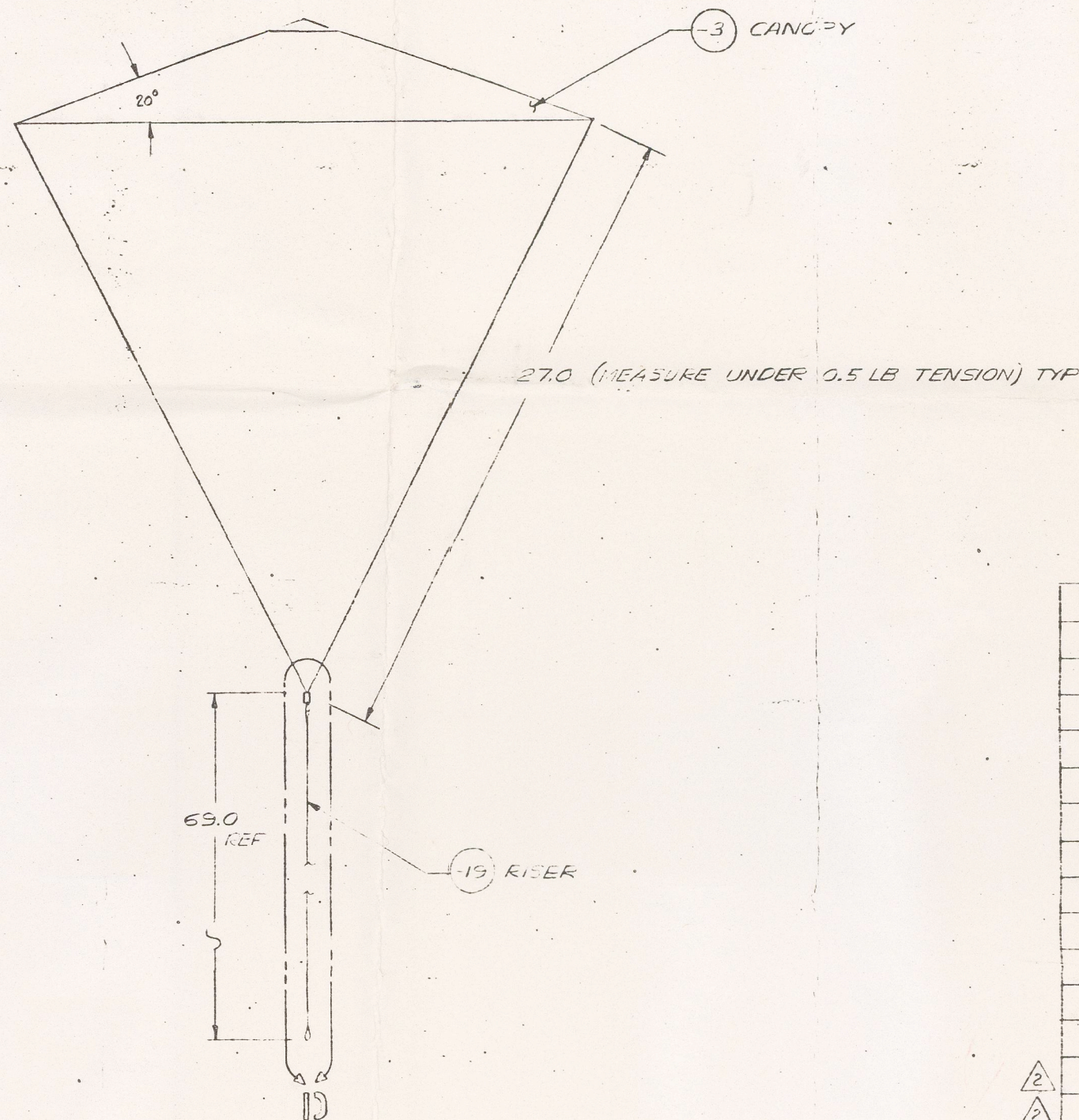
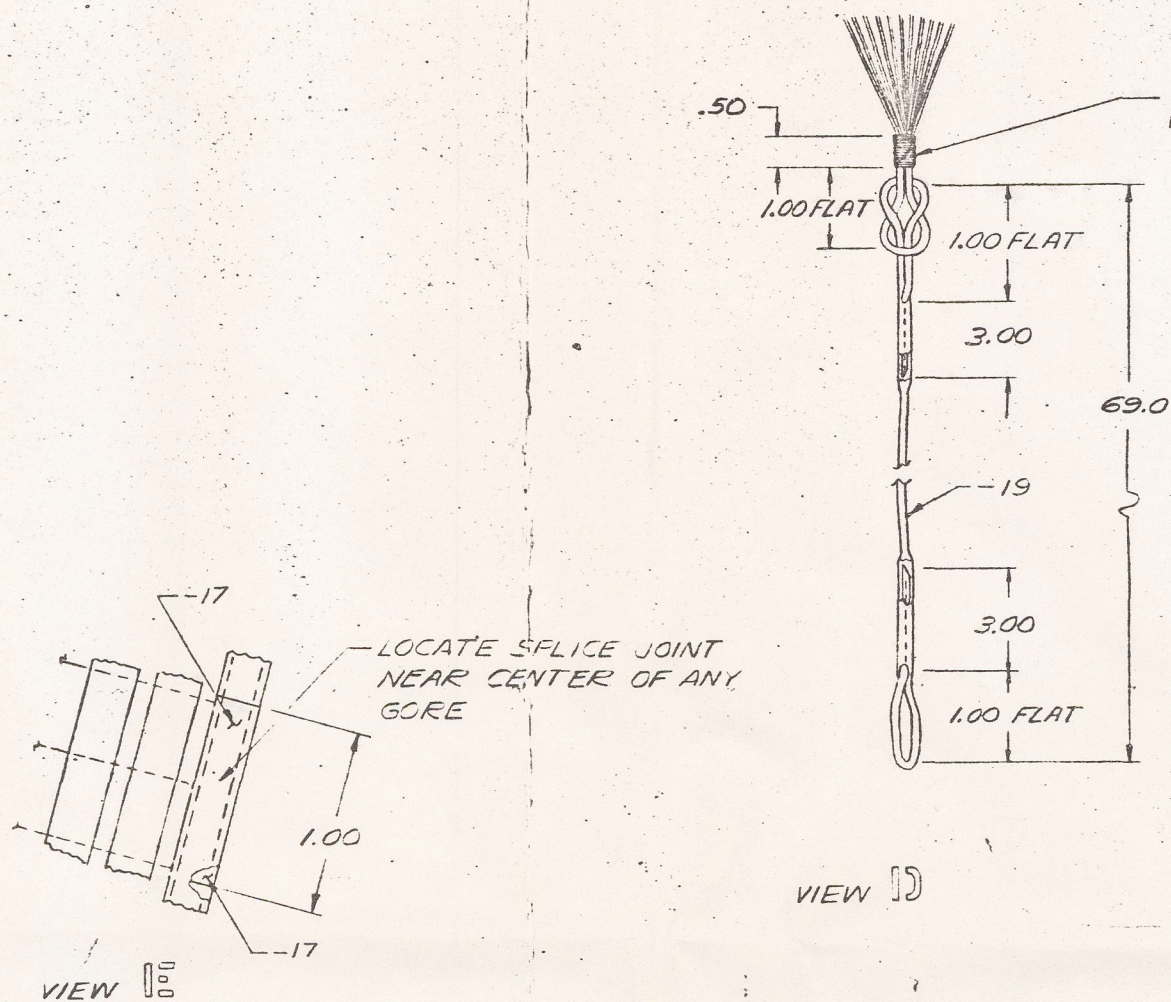
Note: See table V for modifications incorporated  
into the fabricated parachutes.



NOTES: UNLESS OTHERWISE SPECIFIED

1. STITCHING: SIZE E NYLON THREAD (10 TO 12 STITCHES PER INCH)
2. COLOR NATURAL
3. CUT ENDS OF TAPES ARE TO BE TREATED WITH ANTI-FRAY COATING
4. MEASURE UNDER 0.5 LB TENSION

5. ATTACH IDENTITY TAG TO RISER END. INCLUDE FOLLOWING INFORMATION:  
PART NAME, PART NO., SERIAL NO., DATE OF MFG, AND NAME OF MANUFACTURER  
RUBBER STAMP PART NO. AND SERIAL NO. ON GORE 12 (.12-.25 CHARACTERS)
6. RUBBER STAMP GORE NOS NEAR LOWER R.H. CORNER (.12-.25 CHARACTERS)
7. HEAT BASTING WITH HOT NEEDLE IS ACCEPTABLE
8. MASKING TAPE MAY BE USED TO CONTROL HORIZONTAL RIBBON SPACING WHEN STITCHING VERTICALS (TAPE ON ONE SIDE ONLY)
9. MIN. E.D. FOR STITCHING OF WEBBINGS AND TAPES .06



DETAIL - 5 GORE ASSY

REQD PER ASSY	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	SPECIFICATION	MATERIAL OR NOTE	ZONE	ITEM NO.
1	1	15 RISER	MIL-C-265 TYPE I, CL. 1	NYLON TAPES	4	10	23
1	1	17 POCKET BAND	MIL-T-255 TYPE I, CL. 1	NYLON TAPES	11	5	22
6	6	15 VERT LINE	MIL-T-255 TYPE I, CL. 1	NYLON TAPES	11	8	21
6	6	13 SUSPENSION LINE	MIL-T-255 TYPE I, CL. 1	NYLON TAPES	11	7	20
16	16	11 HORIZONTAL	MIL-T-255 TYPE I, CL. 1	NYLON TAPES	7	6	19
5	5	9 VERTICAL	MIL-T-255 TYPE I, CL. 1	NYLON TAPES	7	5	18
2	2	7 RADIAL	MIL-T-255 TYPE I, CL. 1	NYLON TAPES	7	4	17
12	12	5 GORE ASSY			3		16
1	1	3 CANOPY ASSY			4		15

30-5

FRAME 1 OF 2

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES ANGULAR TOLERANCE LINEAR - HUNDREDTHS - .030 THOUSANDTHS - .010	CONTRACT NO.	DATE	TITLE
ON SHEET METAL PARTS ALL BEND RELIEF INSIDE CORNER RADIUS 16 OUTSIDE CORNERS 22 RADIUS OPTIONAL THERE ARE MINIMUM BENDING REQUIREMENTS	DRAFTS- MAN DESIGN APPROVAL STRESS CHECK	J. P. HARRIS J. P. HARRIS J. P. HARRIS J. P. HARRIS	PARACHUTE ASSY-20° CONICAL RIBBON 10 FT D <sub>0</sub> 28 = 24% (1/2 SCALE OF 20 FT D <sub>0</sub> PARACHUTE)
INDICATES SURFACE ROUGHNESS PER USAS B46	PROJECT OFFICE APPROVAL	J. P. HARRIS J. P. HARRIS J. P. HARRIS	SIZE CODE IDENT NO. J 77646 86378
FABRICATE PER SPEC	CUSTOMER APPROVAL	J. P. HARRIS J. P. HARRIS J. P. HARRIS	SCALE 1/16" = 1" WT SHEET 7 OF 7



NOTES: UNLESS OTHERWISE SPECIFIED

1. STITCHING: SIZE E NYLON THREAD (10 TO 12 STITCHES PER INCH)
2. COLOR NATURAL
3. CUT ENDS OF TAPES ARE TO BE TREATED WITH ANTI-FRAY COATING
4. MEASURE UNDER 0.5 LB TENSION



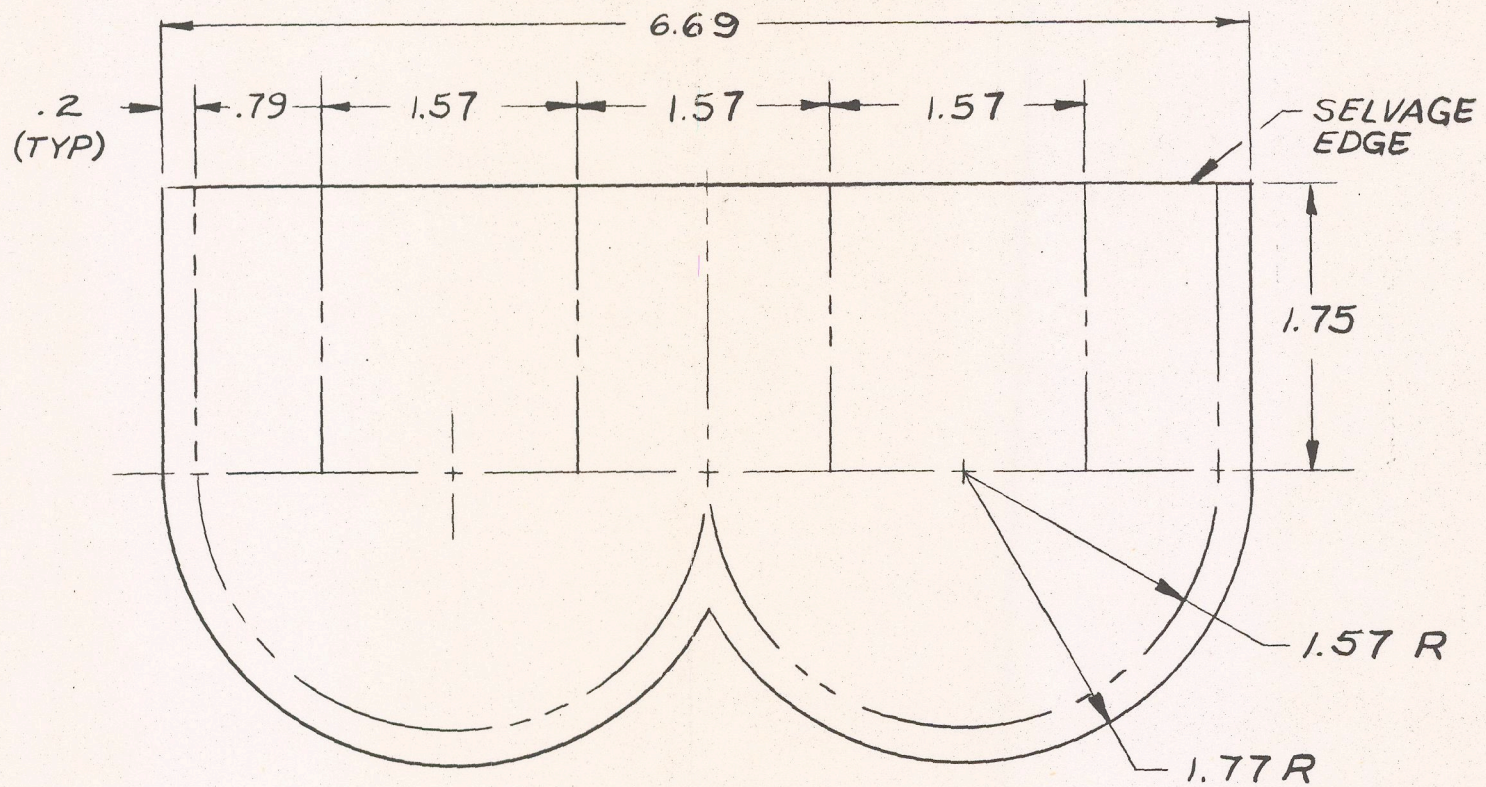
This envelope contains drawing 74QS892

Deployment Bag, Pilot









-1 PATTERN

1. Summary

Under Contract NAS8-30848, Goodyear Aerospace Corporation provided to George C Marshall Space Flight Center the following.

- a. Three 12.5% scale drogue parachute models as described in NASA supplied drawing 86375 which has a porosity of 16% and three 12.5% scale drogue parachute models as described in NASA supplied drawing 86376 which has a porosity of 24%.

Deployment bags were furnished for each of the six drogue parachute models in accordance with NASA supplied drawing 86377.

- b. Two 12.5% scale pilot parachute models as outlined in the NASA supplied drawing 86378. Deployment bags were furnished for each of the two pilot parachute models in accordance with GAC drawing 74QS892.
- c. This final report.

In supplying the above hardware, GAC also.

- a. Reviewed each of the drawings. Recommendations were made and incorporated into the fabrication of the parachutes and deployment bags.
- b. Fabricated tooling aids for the 86375-1, 86376-1, and the 86378-1 parachutes to insure accurate placement of the horizontal ribbons and radial tapes during fabrication of the gores.
- c. Obtained dimensional measurements and overall porosity measurements on each of the parachutes fabricated to insure a data base for interpretation of the wind tunnel test data.



2. Drawing Review

The drogue parachute models, pilot parachute models and their deployment bags were fabricated according to the following drawing.

drogue parachute model	Dwg. No. 86375 and Dwg. No. 86376
deployment bag	Dwg. No. 86377
pilot parachute	Dwg. No. 86378

A copy of each is contained in Appendix A.

In addition, GAC fabricated two pilot deployment bags according to GAC drawing 74QS892. A copy of this drawing is also contained in Appendix A.

Each of the drawings were reviewed for consistency of design in light of their intended use with the result that the changes listed in Tables I through V, were recommended and incorporated into the design of the parachute.

The major difference between the original drawing and that recommended by GAC was the number of horizontal ribbons in each parachute to maintain the desired geometric porosity.

Examination of the MIL-T-5608 Class A, Type I, 1/4 inch wide material received for use as horizontal ribbons in the parachute showed that the material was generally less than the nominal 0.25 inches width as defined in the specification. Ten rolls of the 41 received were measured using a 1/100 inch scale steel rule under 2X magnification. The average width of the ten rolls was 0.234 inches. The specification defines the width tolerance as  $\pm 0.0156$  inches. For the low tolerance the allowable width is 0.2344 inches.